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Draft Environmental Impact Statement

Flint Foothills Vegetation Management - Volume 1

Pintler Ranger District, Beaverhead-Deerlodge National Forest
Granite and Powell Counties, Montana

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Flint Foothills Vegetation Management Project
Draft Environmental Impact Statement
Beaverhead-Deerlodge National Forest, Granite and Powell Counties, Montana

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Abstract: The Beaverhead-Deerlodge National Forest (BDNF), Pintler Ranger District, is proposing the Flint Foothills Vegetation Management Project to address the vegetation conditions in the project area resulting from current insect and disease infestations. The Flint Foothills Vegetation Management Project area encompasses 44,522 acres located on the north end of the Flint Range in the Clark Fork Flint Landscape (Forest Plan pp. 108-109), about 6 miles southeast of Drummond, Montana (figure 1). Eighty-three percent of the area (37,010 acres) is managed by the Beaverhead-Deerlodge National Forest; the remainder is private inholdings (7,512 acres). This Draft Environmental Impact Statement considers the environmental effect of proposed activities including salvage by clearcut harvest regeneration, commercial thinning, and seed tree harvest with reserves, prescribed burning and precommercial thinning, on 5,703 acres.

Alternative 2-Proposed Action is intended to:

- Salvage by clearcut regeneration harvest dead and dying lodgepole pine stands on 1,163 acres.
- Commercial thin ponderosa pine and Douglas-fir stands, including 121 acres of old growth, on 1,149 acres.
- Regenerate by seed tree harvest Douglas-fir and ponderosa pine stands on 353 acres.
- Collectively, the commercial vegetation treatments would provide 16,042 MBF (32,083 CCF) in sawtimber; and 4,010 MBF (8,021 CCF) in non-saw timber.
- Prescribe burn mid-elevation lodgepole pine and low-elevation Douglas-fir and ponderosa pine stands on 1,990 acres.
- Precommercial thin naturally regenerated, lodgepole pine and Douglas-fir stands on 1,048 acres.
- Construct 1.3 miles of new National Forest System road.
- Construct 7.2 miles of new temporary road.
- Add 2.4 miles of road (1.3 miles of new NFS road construction and 1.1 miles of open and closed unauthorized routes) to the Forest transportation system.

Alternative 3 addresses public concerns over new road construction, and logging within old-growth stands. This alternative proposes no new system or temporary roads constructed to access units or accommodate logging within units. No commercial thinning would occur within the understory of old-growth stands. As a result, alternative 3 includes fewer acres of salvage by clearcut regeneration harvest, 666 acres, and commercial thinning, 1,022. All other vegetation treatments remain the same as alternative 2.

This DEIS is made available for a 45-day Comments Period under the provisions of the National Environmental Policy Act (40 CFR 1500-1508), and Notice, Comment, and Appeal Procedures for National Forest System Projects and Activities (36 CFR 215). The Forest Service will accept comments as provided in §215.6(a)(4), beginning on the day following the date of publication of the Notice of Availability (NOA) in the Federal Register.

It is important that reviewers provide their comments to the Forest Service at such times and in such a way that they are useful to the Agency's preparation of the EIS. Therefore, comments should be provided prior to the close of the comment period and should clearly articulate the reviewer's concerns and contentions. The submission of timely and specific comments can affect a reviewer's ability to participate in subsequent administrative review or judicial review. Comments received in response to this solicitation, including names postal and email addresses and telephone numbers of those who comment, will be part of the public record and available for public inspection. Comments submitted anonymously will be accepted and considered; however, anonymous comments will not provide the respondent with standing to participate in subsequent administrative or judicial reviews.

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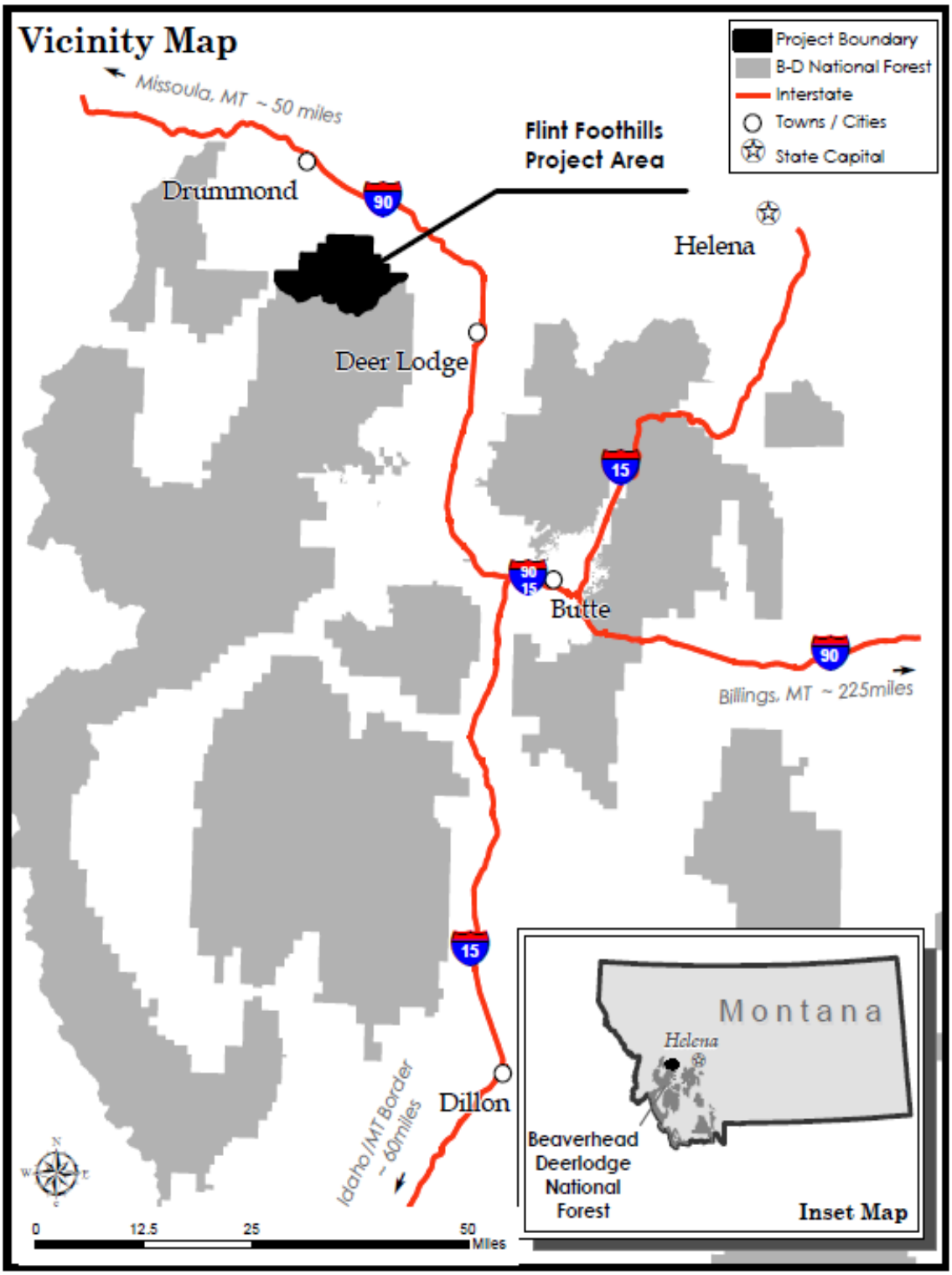

Figure 1. Vicinity map

The USDA Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. Using GIS products for purposes other than those for which they were intended may yield inaccurate or misleading results. The USDA Forest Service reserves the right to correct, update, modify, or replace GIS products without notification. The maps in this document were prepared by TEAMS Enterprise Unit using Beaverhead-Deerlodge National Forest data as of 1/20/2012.

Summary

Introduction

This section is a brief summary of the contents of this Draft Environmental Impact Statement (DEIS). The DEIS begins with chapter 1.

The Beaverhead-Deerlodge National Forest (BDNF), Pintler Ranger District, is proposing the Flint Foothills Vegetation Management Project to address the vegetation conditions in the project area resulting from current insect and disease infestations, or at risk from future infestations. Proposed activities include salvage by clearcut harvest regeneration, commercial thinning, seed tree harvest, precommercial thinning and prescribed burning.

The Flint Foothills Vegetation Management Project area encompasses 44,522 acres located on the north end of the Flint Range in the Clark Fork Flint Landscape (Forest Plan pp. 108-109), about 6 miles southeast of Drummond, Montana (figure 1). Eighty-three percent of the area (37,010 acres) is managed by the Beaverhead-Deerlodge National Forest; the remainder is private inholdings (7,512 acres). Proposed activities for the project follow direction for the Flint Foothills and Flint Uplands Management Areas as described in the 2009 Beaverhead-Deerlodge Forest Plan (Forest Plan, pp. 108-109; 112-115).

Other plans, policies and regulations provide management direction for this project, including but not limited to:

- The National Forest Management Act of 1976 (NFMA) and implementing regulations - The Flint Foothills Project is consistent with the findings required when making project-level decisions involving timber harvest.
- Forest Service Policy - The Flint Foothills Project is consistent with the Forest Service Manual and Handbook direction outlined in this analysis.
- Forest Plan Consistency - The Flint Foothill Project is consistent with the Forest Plan management area direction, and also is designed to meet vegetation goals and objectives within the plan.
- The Endangered Species Act of 1973 - Requires federal agencies to ensure that any agency actions (any action authorized, funded or carried out by the agency) are not likely to jeopardize the continued existence of any threatened, endangered or proposed species.
- Sensitive Species - The sensitive species analysis in this document meets the requirements for a biological evaluation as outlined in FSM 2672.42. Sensitive species are administratively designated by the Regional Forester and managed under the authority of the National Forest Management Act.

Background - Existing Vegetation Conditions in the Project Area

The Flint Foothills area is part of a larger mountain pine beetle (Dendroctonus ponderosae) epidemic occurring across the majority of the Beaverhead-Deerlodge National Forest and on other forests in the Northern Region. Mountain pine beetle has been active in the Flint Foothills area since about 2000, reaching epidemic proportions beginning in 2007. This has resulted in extensive areas of dead and dying lodgepole pine, and the mortality of more individually scattered ponderosa pine and whitebark pine. Within the Flint Foothills Project area on National Forest System (NFS) lands, it is estimated that all (100 percent) of the pine stands 5 inches d.b.h. and larger have been affected by mountain pine beetle. Beetle infestations are a regular force of natural change in forested ecosystems; however, several current outbreaks occurring simultaneously across western North America are the largest and most severe in recorded history (Bentz 2008).

Surveys show that mortality of individual Douglas-fir trees is occurring in the project area due to western spruce budworm (Choristoneura occidentalis). The recent drought conditions and dense stand conditions cause the late-successional stands of Douglas-fir to be susceptible to western spruce budworm because these stands are often stressed by competition. Areas of higher mortality due to western spruce budworm in contiguous stands of Douglas-fir are evident in the Gird Creek to Douglas Creek areas within the project area.

An increase in individual numbers of Douglas-fir trees killed by Douglas-fir bark beetle (Dendroctonus pseudotsugae) has been noted in the Dunkleberg Ridge, Jackson Park and Blum Creek areas. An increase of mortality due to Douglas-fir bark beetle may be attributed to the heavy and repeated defoliation from western spruce budworm, which may lead to increases in Douglas-fir bark beetle activity.

Fire frequency determines the vegetation successional stage and fuel conditions; the shape and size of past fires play a role in fuel connectivity and landscape heterogeneity or homogeneity (Arno et al. 2000, Turner et al. 1998). Forest structure and composition in the Flint Foothills Project area have been most significantly altered due to the lack of fire disturbance. The mid- to high-elevation forests are currently homogeneous, mature stands lacking stand-age diversity. Past fire disturbances suggest a more heterogeneous landscape. Blister rust (Cronartium ribicola) and mountain pine beetle have accelerated succession to subalpine fir by killing mature whitebark pine. Mountain pine beetle has killed the majority of lodgepole pine in the project area. Additionally, mortality of very large ponderosa pine from mountain pine beetles has been noted in the project area through stand exams. Coupled with the lack of fire, these disturbances have caused a major shift in landscape composition and structure from pine to fir and spruce (Keane 2000).

Purpose and Need

The purpose and need of the Flint Foothills Vegetation Management Project is to contribute to achievement of the following Forest Plan goals and objectives:

1. **Forest Plan Timber Management Goals**
   a. *Lands Suitable for Timber Production:* Manage lands suitable for timber production for the growth and yield of sawtimber, crop trees, pulpwood, and other forest products, including salvage harvest.
   b. *Product Utilization:* Forest products would be used to provide economic benefits where project objectives, forest plan objectives, and forest plan standards can be met.
2. **Forest Plan Timber Management Objectives on Lands Suitable for Timber Production**
   a. Bring 10 percent of lands suitable for timber production into a managed condition.[1]
   b. Manage those stands already in a managed condition to maintain long term sustained yield.
3. **Forest Plan Vegetation Management Objectives**
   a. Reduce forest density in the large size classes of dry forest communities and some lodgepole pine communities to maintain or improve forest conditions.
   b. Douglas-fir Type: Increase the number of acres in the 0- to 5-inch d.b.h. class on approximately 20,000 acres.
   c. Lodgepole Pine Type: Increase the number of acres in the 0-to 5-inch d.b.h. class by approximately 74,000 acres.

[1] The Corrected Final Environmental Impact Statement (FEIS) for the Forest Plan identifies 284,000 acres of suitable timber ground (FEIS p. 38). The Forest Plan objective applies to ten percent—28,400 acres of suitable lands on a Forestwide basis for the ten-year planning period of the Plan.

All project treatment units have been proposed on lands classified as “Suitable for Timber Production” using the Forest Plan’s Timber Harvest Classification Protocol (Forest Plan Pg. 42), which includes both coarse-scale GIS modeling and site-specific on the ground reconnaissance. The following table cross-walks proposed treatments with the corresponding Forest Plan Goal/Objectives.

Table S- 1. Cross-walk between the purpose and need Forest Plan goals and objectives, and the proposed action

Purpose and Need (See Numbered Forest Plan Goals/Objectives Above)	Vegetation Treatment Type	Acres of Treatment	Volume Saw/non-saw MBF	Number of Units	Range in Unit Size by Acres
1A and B 2A 3C	Salvage by clearcut harvest dead and dying lodgepole pine (S) Salvage harvest dead and dying LP. Retain all other conifers and FP required snags.	1,163	9,304 /2,326	30	2-94
1A and B 3A	Commercial Thinning ponderosa pine and Douglas-fir (C) Thin low to mid-elevation units to reduce density from an average of 100-140 to 40-60 basal area.	1,149*	5,502/1,376	29	9-175
1A and B 2A 3B	Seed Tree with Reserves (ST) Seed Tree harvest for ponderosa pine regeneration. Reserve trees are larger diameter Douglas-fir and ponderosa pine, in addition to seed trees	353	1,236/309	6	8-139
3A	Prescribed Burn (B) Use ignited fire to burn low elevation dry forest units	731	N/A	5	15-298
3C	Prescribed Burn (B) Use ignited fire to burn in mid-elevation mixed conifer units	1,259	N/A	3	251-710
1A 2B	Precommercial Thinning (P) Thin sapling-sized trees in old harvest units	1,048	N/A	20	9-187
	Total	**5,703**		**93**	**2-710**

*Includes 121 acres of old-growth

Changes to the Proposed Action since Publishing the Notice of Intent

Field reviews of the proposed treatment units were completed by the interdisciplinary team members subsequent to publishing the Notice of Intent (NOI) in June 2011 and mailing the June 7, 2011 scoping letter. These reviews resulted in updates to the proposed action, including changes in treatment prescriptions, unit boundary changes, and the addition and deletion of units. Many of the originally proposed precommercial thinning units were identified as previously thinned, and therefore, dropped from the list of units proposed for treatment. Other units were identified for density reduction, and therefore, added to the list of units proposed for treatment. Overall, the net changes resulted in the addition of 92 acres of commercial treatments, and a reduction of 98 acres of precommercial thinning, for a net change of 6 fewer acres in the updated DEIS proposed action.

June 2011 scoping identified approximately 10 miles of temporary road construction and 72 miles of National Forest System roads (NFS roads) needed for access and hauling. Haul route needs were refined in the updated

proposed action presented in this DEIS. A distinction is made between NFS roads[2], and existing open and closed unauthorized routes (UR)[3] [4] One segment of new temporary road construction in the June 2011 scoping was determined to need construction specifications due to steep slopes and is now proposed as new National Forest System road construction (1.3 miles).

Table S- 2 displays the changes in activity acreages and haul route mileages between the proposed action presented in June 2011, and the updated proposed action in this document.

Table S- 2. Comparison of the June 2011 proposed action and the updated action proposed in the DEIS

Treatment Type	**June 2011 Scoping Proposed Action Acres**	**Updated DEIS Proposed Action Acres**
Salvage by clearcut	863	1,163
Commercial thinning	1,007	1,149
Seed tree with reserves	0	353
Combination salvage by clearcut and commercial thinning	703	0
Prescribed burning	1,990	1,990
Precommercial thinning	1,146	1,048
Total Acres	**5,709**	**5,703**
Haul Routes within the Project Boundary	**June 2011 Scoping Miles**	**DEIS Miles**
NFS roads, existing	72	68.2
NFS roads, proposed on open and closed URs	0	1.1
NFS roads, proposed new construction	0	1.3
Temporary roads, on open and closed URs	0	4.4
Temporary roads, proposed new construction	10	7.2
Total Miles	**83**	**82.2**

Alternatives

Alternative 1 – No Action

Under the no-action alternative, no salvage of lodgepole pine by clearcut harvest, commercial thinning, seed tree harvest, prescribed burning, or precommercial thinning would be implemented to accomplish project and Forest Plan objectives.

Alternative 2 and Alternative 3

Treatments

Alternatives 2 and 3 differ by the number of units and total acreages for salvage by clearcut harvest, and commercial thinning of ponderosa pine and Douglas-fir stands. There is no difference in treatment acres

[2] A National Forest System road is a forest road other than a road which has been authorized by a legally documented right-of-way held by a State, county or other local public road authority.

[3] An unauthorized road is a road that is not a forest road or a temporary road and that is not included in a forest transportation atlas.

[4] A route is a road or a trail.

between the alternatives for seed tree harvest, prescribed burning and precommercial thinning treatments. Table S- 3 displays the proposed activities for alternative 2 and alternative 3 and clearly shows the differences associated with each alternative.

Table S- 3. Comparison of vegetation treatment acreages and number of units for Alternatives 2 and 3

Vegetation Treatment	Alternative 2 (Proposed Action) Acres	Alternative 3 Acres	Difference in Acres	Alternative 2 Number of Units	Alternative 3 Number of Units	Difference in Number of Units
Salvage by clearcut harvest	1,163	1,022	141	30	25	5
Commercial thinning	1,149	666	483	29	24	5
Seed tree with reserves	353	353	0	6	6	0
Prescribed burning	1,990	1,990	0	8	8	0
Precommercial thinning	1,048	1,048	0	20	20	0
Totals	**5,703**	**5,079**	**624**	**88**	**83**	**10**

Logging Systems

Treatments would generally be accomplished with conventional, ground-based timber harvest equipment such as rubber-tired skidders, and would be limited to slopes less than 35 percent. Cable logging systems would be used where slopes are greater than 35 percent.

Trees would be whole tree logged and skidded to central landing areas adjacent to roads where they would be processed into logs and loaded on trucks for transport to area sawmills. Unmerchantable material brought to the landing would be piled for chipping or burning. Burning would occur when weather and ground conditions are suitable to maintain air quality, and burning can be controlled.

Haul Routes

Existing Forest roads,[5] NFS roads, and unauthorized routes would be utilized as haul routes. The total mileage varies by alternative.

All unauthorized routes currently exist on the ground. The open unauthorized routes are currently open to public motor vehicle travel, and displayed on the Beaverhead-Deerlodge National Forest North Map 2010 as open roads, consistent with the Forest Plan. The closed unauthorized routes are currently closed to public motor vehicle travel, and are not displayed on the Beaverhead-Deerlodge National Forest North Map 2010. Physically, the existing and closed routes are similar.

Two unauthorized routes, UR8-260 (open) and UR8-253 (open and closed segments) would be added to the Forest transportation system and would be managed as maintenance level 2 roads (high clearance vehicles recommended).They are designated as “NFS roads proposed” on the summary tables and alternative maps[6].

[5] A Forest road is wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization of the National Forest System and the use and development of its resources.

[6] Forest Service Manual (FSM) 7703.26 provides direction on adding roads to the forest transportation system, including unauthorized routes. Decisions must be informed by travel analysis; in this case, the Pintler RD conducted an internal travel analysis in 2008. The analysis is on file at the Pinter RD. This process is distinguished from designating routes and

Route UR8-260 accesses private land. All of UR 8-253, including the closed section, is currently displayed on the Beaverhead-Deerlodge National Forest North Map 2010 as an open road. The closed section is proposed to be added to the Forest transportation system, consistent with the Beaverhead-Deerlodge National Forest North Map 2010. The routes and mileages of other unauthorized routes proposed for use, both open and closed are provided in the alternative descriptions.

New temporary roads[7] constructed for project use would be decommissioned following project implementation of authorized activities, consistent with Forest Service policy (FSM 7703.24) which states that temporary roads are to be decommissioned. Decommissioning is an activity that results in stabilization and restoration of unneeded roads (or trails) to a more natural state (FSM 7705). The roads would be closed with a combination of signs and berms to allow for a subsequent travel management planning effort to consider these routes for addition to the system or more physical methods of decommissioning such as obliteration.

Road maintenance or reconstruction would occur on the haul route portions of all NFS roads and Forest roads associated with the project, either during or prior to commercial harvest activities. The open and closed unauthorized routes would be reconstructed. These activities would bring the roads to a standard complying with BMPs and also allow for safe product removal. Road maintenance typically involves grading, drainage features such as culverts, ditches, drainage dips, and spot surfacing as needed to meet Best Management Practices (BMPs). Reconstruction activities would include the maintenance items as well as more significant roadway improvement and/or realignment: embankment and slump repair, curve widening, subgrade boulder or cobble excavation and removal, and upgrades to accommodate safe timber haul. Timing of project activities would comply with existing travel management direction.

Alternative 2 – Proposed Action

The proposed action would achieve project objectives through a mix of vegetation treatments. A map of the proposed action is available in chapter 2 of this DEIS.

Alternative 2-Proposed Action would:

Treatments

- Salvage by clearcut regeneration harvest dead and dying lodgepole pine stands on 1,163 acres.
- Commercial thin ponderosa pine and Douglas-fir stands, including 121 acres of old growth, on 1,149 acres.
- Regenerate by seed tree harvest Douglas-fir and ponderosa pine stands on 353 acres.
- Collectively, the commercial vegetation treatments would provide 16,042 MBF (32,083 CCF) in sawtimber; and 4,010 MBF (8,021 CCF) in non-saw timber.
- Prescribe burn mid-elevation lodgepole pine and low-elevation Douglas-fir and ponderosa pine stands on 1,990 acres.
- Precommercial thin naturally regenerated, lodgepole pine and Douglas-fir stands on 1,048 acres.
- Construct 1.3 miles of new National Forest System road.
- Construct 7.2 miles of new temporary road.

areas for motor vehicle use under the travel management regulations, which results in a MVUM (motor vehicle use map).

[7] A temporary road is a road necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road or a forest trail and that is not included in a forest transportation atlas.

- Add 2.4 miles of road (1.3 miles of new NFS road construction and 1.1 miles of open and closed unauthorized routes) to the Forest transportation system.

Table S- 4. Proposed activities for alternative 2 by acres, number of units and range in size of units

Vegetation Treatment Type	Acres of Treatment	Number of Units	Range in Unit Size by Acres
Salvage by clearcut harvest dead and dying lodgepole pine (S): Salvage harvest dead and dying LP. Retain all other conifers and FP required snags.	1,163	30	2-94
Commercial thinning ponderosa pine and Douglas-fir (C): Thin low to mid-elevation units to reduce density from an average of 100-140 to 40-60 basal area.	1,149*	29	9-175
Seed tree with reserves (ST): Seed Tree harvest for ponderosa pine regeneration. Reserve trees are larger diameter Douglas-fir and ponderosa pine, in addition to seed trees.	353	6	8-139
Prescribed burning (B): Use ignited fire to burn in mid-elevation mixed conifer units and low elevation dry forest units.	1,990	8	15-710
Precommercial thinning (P): Thin sapling-sized trees in old harvest units.	1,048	20	9-187
Totals	**5,703**	**93**	**2-710**

* Includes 121 acres of old growth in 4 units

Haul Routes

Under alternative 2, 109.1 miles of road would be used as haul routes. Table S-2 identifies the roads and associated mileages.

- A total of 100.6 miles of existing roads, including unauthorized routes, would be utilized as haul routes. This includes 68.2 miles within the project area boundary that are displayed in figure 5 in chapter 2. The remaining 26.9 miles are private, county, and NFS road outside the project area (figure 3). Approximately 58.9 miles would be maintained, and 41.7 miles would be reconstructed.
- Approximately 1.3 miles of new roads would be constructed for haul to access units 36S and 47S. The site conditions require the need for specified road construction, as opposed to temporary road. These roads would be added to the Forest transportation system as NFS roads. They would be put into storage (maintenance level 1) for future access following implementation of the Flint Foothills project. These roads would be closed to all motor vehicle use during the time they are in storage.
- Approximately 7.2 miles of new temporary road would be constructed, utilizing construction measures such as outsloping, drainage dips, and water-spreading ditches. Following completion of the vegetation projects, the new temporary roads would be decommissioned by obliteration, in which the road prism is recontoured; cut and fill slopes are restored to natural grades; and slash, stumps, and woody debris are placed on top of the corridor to effectively block vehicle travel
- Approximately 4.4 miles of open and closed unauthorized routes would be reconstructed and utilized as haul routes. Following project implementation, these routes would be decommissioned by various methods (table 6).
- Just over 1 mile of open and closed unauthorized routes would be reconstructed, utilized as haul routes and added to the Forest transportation system following reconstruction. They would be managed as maintenance level 2 roads (high clearance vehicles recommended).

Table S- 5. Proposed haul routes, miles and road/route number

Haul Routes	Alternative 2-Proposed Action Miles	Road/Route Numbers
Forest roads and NFS roads, existing (outside of the project area)	26.9	State Highway 1 Forest Road 676 (Finley Basin Road). NFS Road 1500 (Eureka Ridge Road) NFS Road 8402 (Gird Creek Road) Douglas Creek Road Forest Road 8454 (East Gird Creek) NFS Road 8454 Gold Creek and Mullan Trail Roads Forest Road 636 (Gold Creek)
NFS roads existing (inside of the project area)	68.2	NFS roads: 1522, 1522A, 1544, 1550, 1557, 1589, 19752, 5023, 5123, 5151, 5152, 5153, 5160, 5161, 5162, 5167, 5168, 636, 666,707, 73549, 78434, 78442, 78461, 78462, 78463, 78464, 78468, 78469, 78470, 78472. 78475, 78476, 78480, 78484, 78489, 78494, 78617, 8402, 8454, 8506, 8510, 8615
NFS roads proposed (on open UR)	0.7	UR8-253 UR8-260
NFS road proposed (on closed UR)	0.4	UR8-253
NFS roads proposed (new construction)	1.3	N1, N2
Temporary roads (on open URs)	1.0	UT8-110 UR8-246 UR8-271
Temporary roads (on closed UR)	3.4	T17, T19, T24, T26 (UR8-270), T28 (UR8-284), T32 (UR8-257), T34, T35 (78422)
Temporary, proposed (new construction)	7.2	T1-T16; T18; T20-T23; T27; T33; T36-T39
Total Miles	**109.1**	

Alternative 3

Treatments

Alternative 3 addresses public concerns about new road construction and the associated potential for increased sediment delivery to streams and invasive plant expansion and establishment; and managing (commercial thinning) within old-growth stands. This alternative proposes no new NFS or temporary road construction to access units or to accommodate logging within units. No commercial thinning would occur within the understory of old-growth stands. As a result, alternative 3 includes fewer acres of salvage by clearcut regeneration harvest, 666 acres, and commercial thinning, 1,022 acres. All other vegetation treatments remain the same as alternative 2. Collectively, the commercial vegetation treatments would provide 12,686 MBF (25,372 CCF) in sawtimber; and 3,172 MBF (6,343 CCF) in non-saw timber.

Alternative 3 eliminates eight units (36S, 47S, 72S, 48C, 56C, 57C, 68C, and 71C) requiring new temporary road construction for access to the unit, thereby eliminating the need for new temporary road construction. Five units (52S, 73S, 12C, 23C, and 80C) utilize open and closed unauthorized routes to and within the unit to accommodate logging; no new temporary roads would be constructed. Instead, longer skidding distances, which average 1,425 feet, would be utilized to log the unit with ground-based systems.

In addition, four units are reduced in size (23C, 25C, 55C, and 6C) by a total of 121 acres to eliminate commercial understory thinning of old-growth stands under alternative 3. A map displaying the location of activities proposed for alternative 3 is available in chapter 2.

Table S- 6. Proposed activities for alternative 3 by acres, number of units and range in size of units

Vegetation Treatment	Alternative 3 Acres	Number of Units	Range in Unit Size by Acres
Salvage by clearcut harvest	666	25	2-94
Commercial thinning	1,022	24	9-118
Seed tree with reserves	353	6	8-139
Prescribed burning	1,990	8	15-710
Precommercial thinning	1,048	20	9-187
Totals	**5,070**	**83**	**2-710**

Haul Routes

Under alternative 3, 85.5 miles road would be utilized as haul routes. No new roads would be constructed Table S- 7 identifies the roads and associated mileages. Two open and closed unauthorized routes would be added to the Forest transportation system. Other unauthorized routes proposed for use would be reconstructed then decommissioned following project implementation.

- A total of 85.5 miles of existing roads, including unauthorized routes, would be utilized as haul routes. This includes 66.4 miles within the project area boundary. The remaining 15.7 miles are private, county, and NFS road outside the project area. Approximately 47.1 miles would be maintained, and 38.3 miles would be reconstructed.
- Approximately 2.3 miles of open and closed unauthorized routes would be reconstructed and utilized as haul routes. Following project implementation, these routes would be decommissioned by various methods.
- Just over 1 mile of open and closed unauthorized routes would be reconstructed, utilized as haul routes and added to the Forest transportation system. They would be managed as maintenance level 2 roads (high clearance vehicles recommended).

Table S- 7. Haul route mileage summaries for alternative 3

Haul Routes	Alternative 3 Miles	Road/Route Numbers
Forest roads and NFS roads, existing (outside of the project area)	15.7	State Highway 1 Forest Road 676 (Finley Basin Road). NFS Road 1500 (Eureka Ridge Road) NFS Road 8402 (Gird Creek Road) Douglas Creek Road Forest Road 8454 (East Gird Creek) NFS Road 8454 Gold Creek and Mullan Trail Roads Forest Road 636 (Gold Creek)
NFS roads, existing (inside of the project area)	66.4	NFS roads: 1522, 1522A, 1544, 1550, 1557, 1589, 19752, 5023, 5123, 5151, 5152, 5153, 5160, 5161, 5162, 5167, 5168, 636, 666,707, 73549, 78434, 78442, 78461, 78462, 78463, 78464, 78469, 78470, 78472. 78475, 78476, 78480, 78489, 78494, 78617, 8402, 8454, 8506, 8510, 8615
NFS roads, proposed (on open UR)	0.7	UR8-253 UR8-260
NFS roads, proposed (on closed UR)	0.4	UR8-253
Temporary road (on open UR)	0.4	UR8-246
Temporary roads (on closed UR)	1.90	T17. T19, T24, T34, T35 (78442)
Total Miles	**85.5**	

Project Design Features and Mitigation Measures

The Forest Service developed project design features and mitigation measures that are part of the action alternatives. Project design features and mitigation measures are incorporated as an integrated part of alternatives 2 and 3, and are nondiscretionary once approved in a decision. They are based upon standard practices and operating procedures that have been employed in similar circumstances and conditions. The line officer and Forest specialists would review project design features and mitigation measures that would be applied through a timber sale contract, prior to contract advertisement.

Decision Framework

The Forest Supervisor of the Beaverhead-Deerlodge National Forest is the responsible official for this project, and will decide whether to implement the proposed action, one of the other alternatives (including the no-action alternative), subsets of an alternative, or combination of alternatives that would best meet the purpose and need.

The Forest Supervisor will determine that the selected alternative complies with relevant management direction and existing policies, programs and plans, whether risks to people and the environment are properly mitigated and whether project-specific monitoring measures are necessary.

Public Involvement

Initial scoping for the Flint Foothills Vegetation Management Project began in July 2010, when the Forest solicited public comment on a proposal to use clearcut salvage logging, commercial and precommercial thinning, and prescribed burning to harvest timber and restore resiliency on about 5,600 acres. The proposal

was to analyze the effects of the proposed action and any alternatives in an environmental assessment to determine if there would be significant effects.

The Forest received seven response letters in the initial round of scoping. Based on the controversial nature of these letters, we decided to prepare an environmental impact statement, and initiated the second round of scoping in June 2011. The Forest received eight response letters from the second round of scoping, two of which were duplicates from initial scoping. Several issues and concerns were raised about the project and resulted in refinement of the proposal.

The Flint Foothills Vegetation Management Project has appeared on the NEPA Schedule of Proposed Actions (SOPA) since June 1, 2011. The quarterly SOPA provides information about ongoing and planned project proposals. This report is available on the BDNF website.

Influence of Scoping Comments on Alternative Development

The responsible official and the interdisciplinary team (IDT) reviewed all public comments submitted during both scoping periods to determine how they would be considered in the analysis. Several comments requested that alternatives be developed in response to expressed resource concerns. Comments about road construction and old-growth were identified by the responsible official and the IDT as issues to formulate an alternative to the proposed action. Other comments were used to refine the proposed action while still meeting the purpose and need for the project. Many comments were addressed in the analysis; and still others were previously decided by law or regulations, the Forest Plan, or were not related to the purpose and need of the project. All scoping comments and the Forest's responses are in appendix B of this document. Original letters are available in the project file. Several suggestions for alternatives to be considered were submitted during public comment.

The following discussion describes how comments influenced the development of alternatives.

Issues Used to Formulate an Alternative

Comments about road construction and old growth were used to develop an alternative to the proposed action.

Road Construction

Several scoping comments expressed concerns that road construction and subsequent use could negatively affect water quality through sediment delivery to streams, or would create ideal conditions for weed establishment. The commenters encouraged minimizing or eliminating construction of both temporary and NFS roads. To address this concern, alternative 3 was developed to exclude new road construction.

Old Growth

Several scoping comments identified concerns about managing and retaining old growth in the project area, specifically requesting a 20-25 percent retention level of old growth for wildlife. Alternative 3 was developed to address the concerns for managing and retaining old growth in the Flint Foothills area. Alternative 3 retains all existing old growth in a multi-storied condition; no understory thinning would occur in old-growth stands. This is in contrast to the proposed action, which thins the understory of 121 acres in existing old growth, retaining the old growth in a single-storied stand condition. Both action alternatives retain all of the existing old-growth acres within the project area.

Providing old growth at a prescribed level (e.g. the suggested 20-25 percent recommendation) can be done if old growth exists at that level in the project area. Forest Plan Standard 1 for Vegetation states: Mechanical vegetation treatments and prescribed fire in old-growth stands (see FP Glossary) do not reduce the age and number of large trees and basal area below the 'minimum criteria' required for Eastern Montana old growth in Green et al. table 3. Removing hazardous fuels within old growth stands is allowed if conducted in a manner

that meets this requirement. This requirement does not apply to hazard tree removal and other public safety needs (Forest Plan, p. 44).

Comments Addressed through Project Design

Whitebark Pine

Include an alternative that excludes burning in the presence of whitebark pine regeneration: One scoping comment requested an alternative that excludes burning in the presence of whitebark pine regeneration, and that 'daylighting' of seedlings and saplings be an alternative method to the use of prescribed fire. 'Day-lighting' is directional falling of competing conifer trees around whitebark pine; in essence, thinning around whitebark pine trees. Whitebark pine is known to occur in three proposed mid-elevation units (Units 3B, 4B and 5B), based on formal surveys.

Specific design criteria were added to exclude prescribed burning in the presence of whitebark pine regeneration. A project design feature was created for hand felling of conifers prior to prescribed fire activities to facilitate underburning; areas with concentrations of whitebark pine would be avoided. Additionally, ignition patterns would avoid the use of fire directly in areas where whitebark pine occurs in groups or clumps. This would provide a means of protecting live, mature trees and established whitebark pine regeneration, and would create favorable ecological conditions for regeneration on areas of existing whitebark pine, without the effects of fire. While there is potential for individual whitebark pine trees to be killed with prescribed burning treatments, the resulting canopy openings would be conducive for seeding by Clarks nutcrackers.

Spread of Invasive Plants

Provide an alternative that eliminates units that have invasive plant species present on roads within units from fire management proposals: All proposed treatment units and access routes were surveyed in 2011 for presence of invasive plants. Based on these surveys, there are no prescribed burn units that have invasive plants present along roads within the units.

Units 2B and 7B have a moderate amount of spotted knapweed (*Centaurea maculosa*) populations (estimated 4-7 acres). Three other units have small infestations (0.01 acre or less): Unit 5B has a small infestation of yellow toadflax (*Linaria vulgaris)* adjacent to NFS Road 5167, which serves as the unit boundary; and units 6B and 8B have small (0.01acre) infestations of spotted knapweed along NFS roads 78493 and 8615, respectively, which serve as the unit boundaries. A project design feature was created to aggressively treat prescribed burn units containing invasive plant species following prescribed fire activities. The invasive plants would be controlled following procedures in the Noxious Weed Control Program Record of Decision for the Beaverhead-Deerlodge National Forest (USDA Forest Service 2002, appendix H). A map of the 2011 survey findings of all of the units and access roads is found in the Invasive Plant section, figure 25.

Provide an alternative that includes land management standards that will prevent new invasive plant species infestations by addressing the causes of weed infestation: Invasive plant design criteria and mitigation measures have been incorporated into the action alternatives to ensure an overall low risk of invasive plant establishment and spread from proposed activities. These practices comply with existing law, Executive Order, and Forest Service policy as discussed in the Invasive Plants section of this DEIS. The alternatives apply the policies and procedures in a site-specific manner to minimize the likelihood of invasive plant establishment and spread during project implementation.

Summary Comparison of Alternatives

Table S- 8. Comparison of alternatives showing how well project purpose and need is achieved and predicted preliminary effects on issues and resource concerns

Comparison Values	Alternative 1-No Action	Alternative 2 Proposed Action	Alternative 3
Purpose and Need			
1A: Manage lands suitable for timber production for the growth and yield of sawtimber, crop trees, pulpwood, and other forest products, including salvage harvest. ***1B: Forest products would be used to provide economic benefits where project objectives, forest plan objectives, and forest plan standards can be met.***			
Acres of lodgepole pine regenerated	0 acres	1,163 acres	1,022 acres
Lodgepole pine volume (salvage by clearcut harvest)	0	Sawtimber: 9,304 MBF (18,608 CCF) Non-sawtimber 2,326 MBF (4,652 CCF)	Sawtimber: 8,176 MBF (16,352 CCF) Non-sawtimber 2,044 MBF (4,088 CCF)
Acres of Douglas –fir /ponderosa pine stands commercial thinned to 40-60 basal area	0 acres	1,149 acres (including 121 acres old-growth)	666 acres (0 acres old-growth
Commercial thinning volume	0	Sawtimber: 5,502 MBF (11,004 CCF) Non-sawtimber 1,376 MBF (2,751 CCF)	Sawtimber: 3,275 MBF (6,549 CCF) Non-sawtimber 819 MBF (1,637 CCF)
Acres of Douglas-fir/ponderosa pine seed tree harvest	0 acres	353 acres	353 acres
Seed tree volume	0	Sawtimber: 1,236 MBF (2,471 CCF) Non-sawtimber 309 MBF (618 CCF)	Sawtimber: 1,236 MBF (2,471 CCF) Non-sawtimber 309 MBF (618 CCF)
2A: Bring 10% of lands suitable for timber production into a managed condition			
Acres of mid- to high-elevation lodgepole pine stands treated with prescribed burning.	0	1,259	1,259
Acres of low-elevation Douglas-fir and ponderosa pine stands treated with prescribed burning.	0	731	731
Total	0	1,990	1,190
2B: Manage those stands already in a managed condition to maintain long term sustained yield.			
Acres of precommercial thinning	0 acres	1,048 acres	1,048 acres

Comparison Values	Alternative 1-No Action	Alternative 2 Proposed Action	Alternative 3
Issues			
Miles of Road Construction			
Specified Road	0 miles	1.3 miles	0 miles
Temporary road, new construction	0 miles	7.2 miles	0 miles
Acres of old-growth thinned	0 acres	121 acres	0 acres
Predicted Project Effects			
Threatened or Endangered Plant Species	No effect	No effect	
Sensitive Plant Species			
Wavy moonwort Peculiar and western moonwort Whitebark pine	No impact	May impact individuals or habitat, but would not likely contribute to a trend towards federal listing or loss of viability to the population or species	
Threatened or Endangered Wildlife Species			
Grizzly bear	No effect	No determination at this time; consulting will be conducted with USFWS	
Sensitive Wildlife Species			
Black-backed woodpecker, Bighorn sheep Fisher Gray wolf North American wolverine Townsend's big-eared bat	No impact	May impact individuals or habitat but would not likely result in a trend toward federal listing or reduced viability of the population or species	
Flammulated owl	May impact individuals or habitat but would not likely result in a trend toward federal listing or reduced viability of the population or species		
Threatened or Endangered Aquatic Species			
Bull trout	No effect	No effect	
Sensitive Aquatic Species			
Westslope cutthroat trout	No impact	May impact individuals or habitat, but would not likely contribute to a trend towards federal listing or loss of viability to the population or species.	
Western toad	No impact	May impact individuals or habitat, but would not likely contribute to a trend towards federal listing or loss of viability to the population or species.	
Invasive Plant Species			
Invasive Plants	Risk of continued spread: low	Risk of continued spread: low risk of increasing density and spread into uninfested lands; and moderate risk of spreading and establishing into areas of concern, including haul routes.	
Soils			
Projected range of detrimental disturbance for harvest units and temporary roads (percentage of field plots classified as detrimentally disturbed)	0 – 8.7 percent	10.0 – 15.0 percent following restoration (subsoiling)	10.0-15.0 percent following restoration (subsoiling)
Stream Sediment Delivery			

Comparison Values	Alternative 1-No Action	Alternative 2 Proposed Action	Alternative 3
Road-stream crossings based on WEPP modeling (average pounds (lb.)/year)	2,761 lb./ year	2,145 lb./yr. during project implementation 1,459 lb./yr. post project implementation	Sediment delivery would be less than alternative 2, because new road segments would not be constructed and there would be less log haul. The greatest input of sediment from roads generally occurs during construction and active log haul during timber harvest.
Air Quality			
Air quality	No effects	Short-term impacts in project vicinity; in full compliance with MDEQ air program with coordination through the Montana/Idaho Airshed Group.	
Scenic Resources			
Scenic integrity	The high mortality of lodgepole pine would increase and have negative effects on the scenic resources. In the immediate foreground and foreground viewing distances, the amount of dead trees can often dominate the viewshed and landscape character, negatively affecting the scenic integrity.	No treatments would be seen from Concern Level 1 (CL1) platforms —Phillipsburg, Drummond, Maxville, Garrison, Grant Kohr's Ranch, Deer Lodge, Pintler Scenic Loop and I-90—areas with a High SIO management objective. Several treatment units would be visible from the Concern Level 2 platforms (NFSRs) within the project area—areas with a Moderate SIO objective. Scenic Integrity Objectives would be met at some point in the future, consist with Forest Plan scenic resource standards.	
Cultural and Heritage Resources			
Cultural and heritage resources	No effects	No effects	
Estimated Present Net Value			
Timber harvest and required design criteria	$0	$912,114	$584,513
All activities	$0	($162,131)	($427,481)

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List of Acronyms

Acronyms	
AMP	Allotment Management Plan
ARM	Administrative Rules of the State of Montana
BDNF	Beaverhead-Deerlodge National Forest
BMPs	Best Management Practices
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWD	Coarse Woody Debris
d.b.h.	Diameter Breast Height
DEIS	Draft Environmental Impact Statement
DSD	Detrimental Soil Disturbance
EPA	Environmental Protection Agency
ERG	Ecosystem Research Group
FACTS	Forest Service Activity Tracking System
FEIS	Final Environmental Impact Statement
FIA	Forest Inventory Analysis
FSDMP	Forest Soil Disturbance Monitoring Protocol
FSM	Forest Service Manual
GIS	Geographic Information Systems
GPS	Global Positioning Systems
HUC	Hydrologic Unit Code
LAU	Lynx Analysis Unit
MA	Management Area

Acronyms	
MDEQ	Montana Department of Environmental Quality
MNHP	Montana National Heritage Program
MOU	Memorandum of Understanding
NEP	Net Ecosystem Productivity
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
NFSR	National Forest System Road
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
OMRTDs	Open Motorized Road and Trail Densities
PVA	Population Viability Analysis
RCA	Riparian Conservation Areas
SHPO	State Historic Preservation Office
SQS	Soil Quality Standards
SWCP	Soil and Water Conservation Practice
TES	Threatened, Endangered and Sensitive
TMDL	Total Maximum Daily Loads
UR	Unauthorized Route
U.S.	United States
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WCT	Westslope Cutthroat Trout
WEPP	Watershed Erosion Prediction Project
WQL	Water Quality Limited
WRCC	Western Regional Climate Center

Chapter 1. Purpose of and Need for Action

Introduction

The Beaverhead-Deerlodge National Forest (BDNF), Pintler Ranger District, is proposing the Flint Foothills Vegetation Management Project to address the vegetation conditions in the project area resulting from current insect and disease infestation, or at risk from future infestations. Proposed activities include salvage by clearcut harvest regeneration, commercial thinning, seed tree harvest, and precommercial thinning and prescribed burning.

The Forest Service has prepared this draft environmental impact statement (DEIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations[8]. This environmental impact statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. Additional documentation is provided in the project file, located at the Pintler Ranger District, 88 Business Loop, Philipsburg, Montana, 59858.

Project Area

The Flint Foothills Vegetation Management Project area encompasses 44,522 acres located on the north end of the Flint Range in the Clark Fork Flint Landscape (Forest Plan p. 108-109), about 6 miles southeast of Drummond, Montana (figure 1). Eighty-three percent of the area (37,010 acres) is managed by the Beaverhead-Deerlodge National Forest; the remainder is private land (inholdings) (7,512 acres). Proposed activities for the project follow direction for the Flint Foothills and Flint Uplands Management Areas (MA's) as described in the 2009 Beaverhead-Deerlodge Forest Plan (Forest Plan, pp. 108-109; 112-115). The Flint Foothills MA comprises 85 percent of the project area and is managed for timber production, livestock grazing and dispersed recreation. The Flint Uplands MA comprises the remaining 15 percent. This area is managed for a mix of semi-primitive motorized and nonmotorized recreation and secure high elevation wildlife habitat. In this management area, "…timber harvest is permitted, but other resource objectives are primary" (Forest Plan, p. 42).

The project area lies within the Clark Fork River-Gold Creek and the Lower Flint Creek watersheds. Lands in the watersheds include National Forest System lands, private lands and lands managed by other agencies (state of Montana, and the United States Department of the Interior (USDI) Bureau of Land Management). Figure **2** shows the spatial relationships between the watersheds, the Clark Fork Flint Landscape, the Flint Foothills and Flint Uplands MA's, the Flint Foothills project area, and all other ownerships.

The project area includes portions of both Powell and Granite Counties. The project area is bounded by private and State-owned lands along the Flint Creek Valley to the west, the Clark Fork River Valley to the north, the Deer Lodge Valley to the east, and the Flint Creek Range to the south. Elevations range from approximately 4,430-9,250 feet. The legal description of lands in the project area follows: T. 8 N., R. 10 W., sec 6; T. 8 N., R. 11 W., sec 1 -11, 15-21, 29, 30; T. 8 N., R. 12 W., sec 1 -19, 21 -26; T. 8 N., R. 13 W., sec 1-3, 10 – 14, 24; T. 9 N., R. 10 W., sec 31; T. 9 N., R 11 W., sec 17 -21, 26 – 36; T. 9 N., R. 12 W., sec 10 – 16, 19 – 36; T. 9 N., R. 13 W., sec 25, 36.

[8] This project tiers to the Beaverhead-Deerlodge National Forest Land and Resource Management Plan Final Environmental Impact Statement (BDNF 2009) and the Beaverhead-Deerlodge National Forest Noxious Weed Control Final Environmental Impact Statement (BDNF 2002).

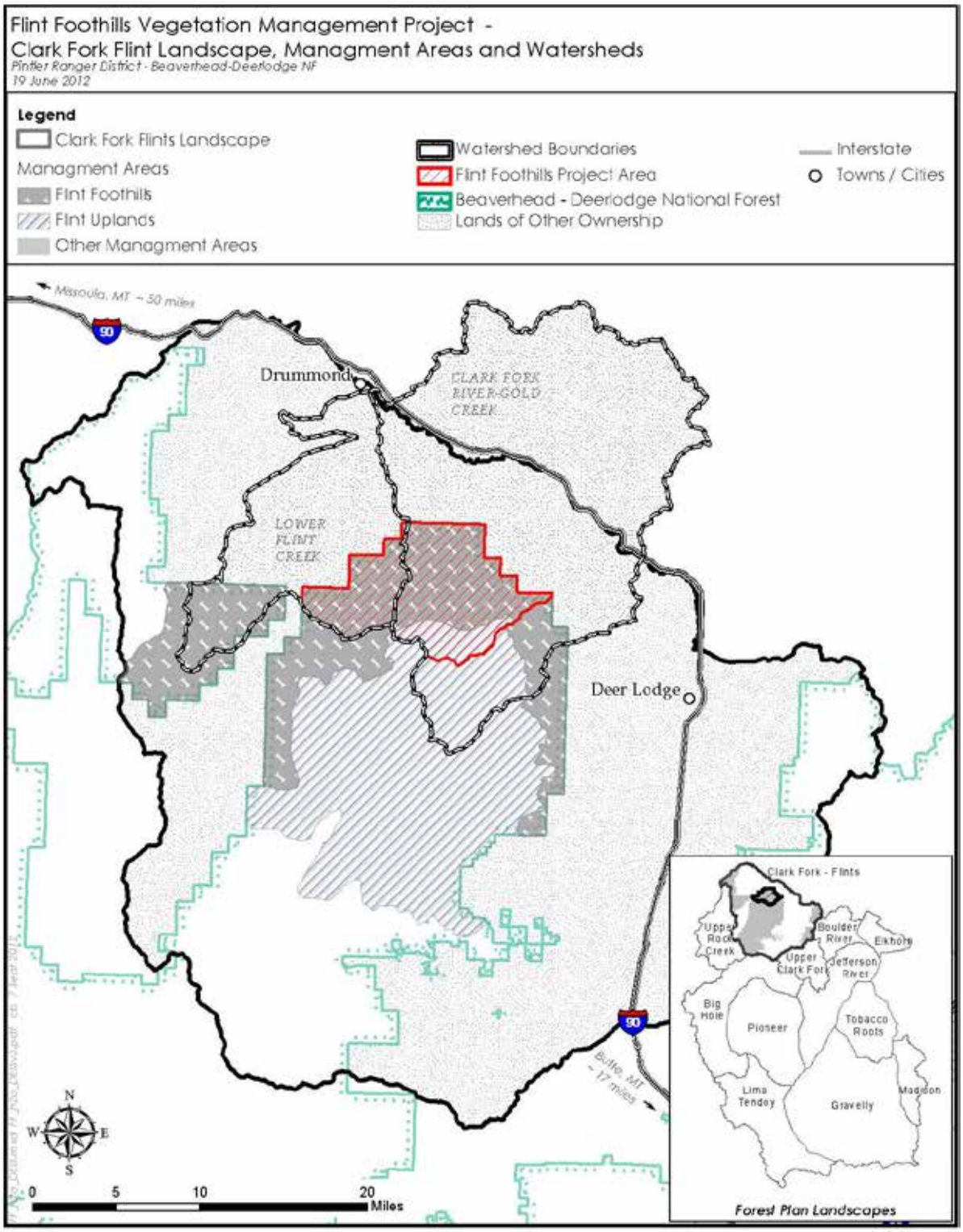

Figure 2. Watersheds, Forest Plan landscape and management areas, and the project area

Background- Existing Vegetation Conditions in the Project Area

The Flint Foothills area is part of a larger mountain pine beetle (Dendroctonus ponderosae) epidemic occurring across the majority of the Beaverhead-Deerlodge National Forest and on other forests in the Northern Region. Mountain pine beetle has been active in the Flint Foothills area since about 2000, reaching epidemic proportions beginning in 2007. This has resulted in extensive areas of dead and dying lodgepole pine, and the mortality of more individually scattered ponderosa pine and whitebark pine. Within the Flint Foothills project area on National Forest System (NFS) lands, it is estimated that all (100 percent) of the pine stands 5 inches diameter breast height (d.b.h.) and larger have been affected by mountain pine beetle. Beetle infestations are a regular force of natural change in forested ecosystems; however, several current outbreaks occurring simultaneously across western North America are the largest and most severe in recorded history (Bentz 2008).

Fire frequency determines the vegetation successional stage and fuel conditions; the shape and size of past fires play a role in fuel connectivity and landscape heterogeneity or homogeneity (Arno et al. 2000, Turner et al. 1998). Forest structure and composition in the Flint Foothills Project area have been most significantly altered due to the lack of fire disturbance. The mid- to high-elevation forests are currently homogeneous, mature stands lacking stand-age diversity. Past fire disturbances suggest a more heterogeneous landscape. Blister rust (Cronartium ribicola) and mountain pine beetle have accelerated succession to subalpine fir by killing mature whitebark pine. Mountain pine beetle has killed the majority of lodgepole pine in the project area. Additionally, mortality of very large ponderosa pine from mountain pine beetles has been noted in the project area through stand exams. Coupled with the lack of fire, these disturbances have caused a major shift in landscape composition and structure from pine to fir and spruce (Keane 2000).

The disruption of the natural fire intervals of the past have resulted in higher stand densities, multi-layered stands of mostly one species, Douglas-fir. In contrast to the open, grown, larger-diameter stands of Douglas-fir and ponderosa pine of the early 1900s, current Douglas-fir stands in the project area are continuous, mid-successional, densely stocked and establishing into dry grassland and quaking aspen communities. The increase in extent and continuity of this vegetation type has effectively reduced landscape vegetation diversity, associated biodiversity, and put unique habitat types in the Flint Foothills Project area (most importantly aspen and seral ponderosa pine communities) at risk of irreversible habitat conversion.

Surveys show that mortality of individual Douglas-fir trees is occurring in the project area due to western spruce budworm (Choristoneura occidentalis). The recent drought conditions and dense stand conditions cause the late-successional stands of Douglas-fir to be susceptible to western spruce budworm because these stands are often stressed by competition. Areas of higher mortality due to western spruce budworm in contiguous stands of Douglas-fir are evident in the Gird Creek to Douglas Creek areas within the project area (figure 10).

An increase in individual numbers of Douglas-fir trees killed by Douglas-fir bark beetle (Dendroctonus pseudotsugae) has been noted in the Dunkleberg Ridge; Jackson Park and Blum Creek areas (figure 11). An increase of mortality due to Douglas-fir bark beetle may be attributed to the heavy and repeated defoliation from western spruce budworm, which may lead to increases in Douglas-fir bark beetle activity.

Purpose and Need for Action

The purpose and need of the Flint Foothills Vegetation Management Project9 is to contribute to achievement of the following Forest Plan goals and objectives:

1. **Forest Plan Timber Management Goals:**
   d. *Lands Suitable for Timber Production:* Manage lands suitable for timber production for the growth and yield of sawtimber, crop trees, pulpwood, and other forest products, including salvage harvest.
   e. *Product Utilization:* Forest products would be used to provide economic benefits where project objectives, forest plan objectives, and forest plan standards can be met.
2. **Forest Plan Timber Management Objectives on Lands Suitable for Timber Production:**
   f. Bring 10 percent of lands suitable for timber production into a managed condition.[10]
   g. Manage those stands already in a managed condition to maintain long term sustained yield.
3. **Forest Plan Vegetation Management Objectives:**
   h. Reduce forest density in the large size classes of dry forest communities and some lodgepole pine communities to maintain or improve forest conditions.
   i. Douglas-fir Type: Increase the number of acres in the 0 to 5 inch DBH class on approximately on approximately 20,000 acres.
   j. C.) Lodgepole Pine Type: Increase the number of acres in the 0 to 5 inch DBH class by approximately 74,000 acres.

All project treatment units have been proposed on lands classified as “Suitable for Timber Production” using the Forest Plan’s Timber Harvest Classification Protocol (Forest Plan Pg. 42), which includes both coarse scale GIS modeling and site-specific on the ground reconnaissance. The following table cross-walks proposed treatments with the corresponding Forest Plan Goal/Objectives:

[9] Referred to from this point forward as the Flint Foothills Project

[10] The Corrected Final Environmental Impact Statement (FEIS) for the Forest Plan identifies 284,000 acres of suitable timber ground (FEIS p. 38). The Forest Plan objective applies to ten percent—28,400 acres of suitable lands on a Forestwide basis for the ten-year planning period of the Plan.

Table 1. Cross-walk between the purpose and need Forest Plan goals and objectives, and the proposed action

Purpose and Need (See Numbered Forest Plan Goals/Objectives Above)	Vegetation Treatment Type	Acres of Treatment	Volume Saw/non-saw MBF	Number of Units	Range in Unit Size by Acres
1 A and B 2A 3C	Salvage by clearcut harvest dead and dying lodgepole pine (S) Salvage harvest dead and dying LP. Retain all other conifers and FP required snags.	1,163	9,304 /2,326	30	2-94
1 A and B 3A	Commercial Thinning ponderosa pine and Douglas-fir (C) Thin low to mid-elevation units to reduce density from an average of 100-140 to 40-60 basal area.	1,149*	5,502/1,376	29	9-175
1 A and B 2A 3B	Seed Tree with Reserves (ST) Seed Tree harvest for ponderosa pine regeneration. Reserve trees are larger diameter Douglas-fir and ponderosa pine, in addition to seed trees	353	1,236/309	6	8-139
3A	Prescribed Burn (B) Use ignited fire to burn low elevation dry forest units	731	N/A	5	12-298
3C	Prescribed Burn (B) Use ignited fire to burn in mid-elevation mixed conifer units	1,259	N/A	3	251-710
1A 2 B	Precommercial Thinning (P) Thin sapling-sized trees in old harvest units	1,048	N/A	20	9-187
	Total	5,703		93	2-710

*Includes 121 acres of old-growth

Proposed Action

The proposed action would achieve project objectives through a mix of vegetation treatments as outlined in this section.

Table 2 displays the treatment types by acres, the number of units and the range of unit sizes. Table 3 displays the roads associated with the haul routes, including construction of 1.3 miles of new National Forest System road[11], and 7.2 miles of new temporary road[12]. In addition, approximately 1 mile of

[11] A National Forest System road is a forest road other than a road which has been authorized by a legally documented right-of-way held by a State, county or other local public road authority.

[12] A temporary road is a road necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road or a forest trail and that is not included in a forest transportation atlas.

existing open and closed unauthorized routes (UR)[13][14] would be added to the forest transportation system[15]. Detailed descriptions are provided in the Alternatives section in Chapter 2. The proposed action would:

- Salvage by clearcut regeneration harvest dead and dying lodgepole pine stands on 1,163 acres.
- Commercial thin ponderosa pine and Douglas-fir stands to reduce stand densities including 121 acres of old growth, on 1,149 acres.
- Regenerate by seed tree harvest Douglas-fir and ponderosa pine stands on 353 acres.
- Provide 16,042 MBF (32,083 CCF) in sawtimber; and 4,010 MBF (8,021 CCF) in nonsaw timber.
- Prescribe burn mid-elevation lodgepole pine and low-elevation Douglas-fir and ponderosa pine stands on 1,990 acres.
- Precommercial thin naturally regenerated lodgepole pine and Douglas-fir stands to reduce stand densities on 1,048 acres.
- Construct 1.3 miles of new National Forest System road.
- Construct 7.2 miles of new temporary road.
- Add 2.4 miles of road (1.3 miles of new National Forest System road and 1.1 miles of open and closed unauthorized routes) to the Forest transportation system.

Table 2. Proposed action vegetation treatments, acres of treatment, number of units and range of unit size by treatment type

Alternative 2 – Proposed Action Vegetation Treatment Type	Acres of Treatment	Number of Units	Range in Unit Size by Acres
Salvage by clearcut harvest dead and dying lodgepole pine	1,163	30	2-94
Commercial thin ponderosa pine and Douglas-fir	*1,149	29	9-175
Seed tree with reserves, Douglas-fir and ponderosa pine	353	6	8-139
Prescribed burn	1,990	8	15-710
Precommercial thin	1,048	20	9-187
Total	**5,703**	**93**	**2-710**

* Includes 121 acres of old growth in 4 units

[13] An unauthorized road is a road that is not a forest road or a temporary road and that is not included in a forest transportation atlas.

[14] A route is a road or trail.

[15] Forest Service Manual (FSM) 7703.26 provides direction on adding roads to the forest transportation system, including unauthorized routes. Decisions must be informed by travel analysis. The Pintler Ranger District completed a preliminary transportation (travel) analysis in 2008, which included the Flint Foothills project area (USDA Forest Service 2008). This analysis assessed inventoried routes within the project area based on resource risks and values. Recommended changes were site specific, route by route, and included: adding routes to the Forest transportation system, decommissioning unneeded routes, closing and storing roads for future use, converting roads to trails, and mitigating resource concerns through road maintenance and reconstruction. The recommendations pertinent to the Flint Foothills Project are incorporated into this analysis. The documentation of the preliminary travel analysis is on file at the Pintler Ranger District office.

Table 3. Proposed haul routes, including existing roads within the project area, and construction of new system and temporary roads.

Haul Routes	Alternative 2-Proposed Action Miles
NFS roads, existing	68.2[16]
NFS roads, proposed (existing open and closed UR)	1.1
NFS roads, proposed (new construction)	1.3
Temporary road (on existing open and closed URs)	4.4
Temporary road proposed (new construction)	7.2
Total Miles	**82.2**

For salvage by clearcut harvest, commercial thin and seed tree treatments, approximately 1.3 miles of new National Forest System road construction and an estimated 11.6 miles of temporary roads would be needed to access and harvest the units. Of the temporary road mileage, about 7.2 miles of newly constructed temporary roads would be needed, and 4.4 miles of open and closed unauthorized routes (UR) would be utilized. Two unauthorized routes, totaling 1 mile, UR 8-260 (0.43 miles) and UR 8-253(0.62 miles) are proposed to be added to the transportation system.

Salvage by clearcut harvest, commercial thinning and seed tree treatments would be accomplished primarily using conventional, ground-based timber harvest equipment such as rubber-tired skidders, and would be limited to slopes less than 35 percent. Approximately 110 acres of commercial harvest in eight units is proposed on slopes greater than 35 percent. Cable logging systems would be used in these areas.

Fifteen proposed units—12 lodgepole pine salvage and 3 Douglas-fir/ponderosa pine seed tree units—exceed 40 acres in size, ranging from 41 to 139 acres. Forest Plan timber standard 2 (Forest Plan, p. 39) allows openings created by one regeneration unit to exceed 40 acres on lands suitable for timber production when a natural event created an undesirable opening. This requires public notification and Regional Forester approval.

Prescribed burning treatments would use aerial ignition for mid-elevation burns; and hand lighting for both mid- and low-elevation and understory burns. Hand falling or slashing of trees may occur to facilitate burning objectives. Burning would occur when weather and ground conditions are suitable to maintain air quality and burning can be controlled. Ignitions may occur over multiple years.

In precommercial thin treatment units, ponderosa pine, Douglas-fir and lodgepole pine (in order of preference) would be retained at 300 to 500 trees per acre to enhance species diversity, improving the long-term resiliency of these stands. Cut trees would be lopped and scattered.

Changes to the Proposed Action since Publishing the Notice of Intent

Field reviews of the proposed treatment units were completed by the interdisciplinary team members subsequent to publishing the Notice of Intent (NOI) in June 2011 and mailing the June 7, 2011 scoping letter. These reviews resulted in updates to the proposed action, including changes in treatment prescriptions, unit boundary changes, and the addition and deletion of units. Many of the originally proposed precommercial thin units were identified as previously thinned, and therefore,

[16] Road mileages are generally rounded to the nearest 1/10 mile in this statement; though rounding to the whole mile is sometimes used in the narratives.

dropped from the list of units proposed for treatment. Other units were identified for density reduction, and therefore, added to the list of units proposed for treatment. Overall, the net changes resulted in the addition of 92 acres of commercial treatments, and a reduction of 98 acres of precommercial thinning, for a net change of 6 fewer acres in the updated DEIS proposed action.

Scoping (June 2011) identified approximately 10 miles of temporary road construction and 72 miles of National Forest System roads needed for access and hauling. Haul route needs were fine-tuned in the updated proposed action presented in the DEIS, as shown in table 4. A distinction is made between NFS roads and existing open and closed unauthorized routes. One segment of new temporary road construction in the June 2011 scoping was determined to need construction specifications due to steep slopes and is now proposed as new National Forest System road construction (1.3 miles).

Table 4 displays the changes in acreages and haul route mileages between the proposed action presented in June 2011, and the updated proposed action in this document. Unit-specific changes from the June 2011 proposed action are described in appendix A.

Table 4. Comparison of the June 2011 proposed action and the updated action proposed in the DEIS

Treatment Type	June 2011 Scoping Proposed Action Acres	Updated DEIS Proposed Action Acres
Salvage by clearcut	863	1,163
Commercial thinning	1,007	1,149
Seed tree with reserves	0	353
Combination salvage by clearcut and commercial thinning	703	0
Prescribed burning	1,990	1,990
Precommercial thinning	1,146	1,048
Total Acres	**5,709**	**5,703**
Haul Routes within the Project Boundary	**June 2011 Scoping Miles**	**DEIS Miles**
Forest Roads (existing)	72	68.2
NFS roads, proposed on URs	0	1.1
NFS roads, proposed new construction	0	1.3
Temporary roads, proposed on URs	0	4.4
Temporary roads, proposed new construction	10	7.2
Total Miles	**83**	**82.2**

Decision Framework

The Forest Supervisor of the Beaverhead-Deerlodge National Forest is the responsible official for this project, and will decide whether to implement the proposed action or one of the other alternatives (including the no action), subsets of an alternative, or combination of alternatives that would best meet the purpose and need.

The Forest Supervisor will determine that the selected alternative complies with relevant management direction and existing policies, programs and plans, whether risks to people and the environment are properly mitigated and whether project-specific monitoring measures are necessary.

Public Involvement

Scoping

A Notice of Intent to Publish an Environmental Impact Statement was published in the Federal Register on June 2, 2011 asking for public comment on the proposal from June 2 to July 5, 2011. In addition, as part of the public involvement process, the Forest mailed a scoping letter to interested parties on June 7, 2011.

Initial scoping for the Flint Foothills Vegetation Management Project began in July 2010, when the Forest solicited public comment on a proposal to use clearcut salvage logging, commercial and precommercial thinning, and prescribed fire to harvest timber and restore resiliency on about 5,600 acres. The proposal was to analyze the effects of the proposed action and any alternatives in an environmental assessment to determine if there would be significant effects.

The Forest received seven response letters in the initial round of scoping. Several of the letters supported the proposal; others strongly disagreed with components of the proposal and contended there was potential for significant cumulative effects.[17] Based on the controversial nature of these letters, we decided to prepare an environmental impact statement, and initiated the second round of scoping in June 2011. The Forest received eight response letters from the second round of scoping, two of which were duplicates from initial scoping.

The Flint Foothills Vegetation Management project has appeared on the NEPA Schedule of Proposed Actions (SOPA) since June 1, 2011. The quarterly SOPA provides information about ongoing and planned project proposals. This report is available on the BDNF website http://www.fs.fed.us/nepa/nepa_project_exp.php?project=33238

Influence of Scoping Comments on Alternative Development

The responsible official and the interdisciplinary team (IDT) reviewed all public comments submitted during both scoping periods to determine how they would be considered in the analysis. Several comments requested alternatives be developed in response to expressed resource concerns. Comments on road construction and old growth were identified by the responsible official and the IDT as issues to use to formulate an alternative to the proposed action. Other comments were used to refine the proposed action while still meeting the purpose and need for the project. Many comments were addressed in the analysis; and still others were previously decided by law or regulations, the Forest Plan, or were not related to the purpose and need of the project (scoping comments and responses are in appendix B). Original letters are available in the project file located at the Pintler Ranger District. Several suggestions for alternatives to be considered were submitted during public comment.

Issues Used to Formulate an Alternative

Comments on road construction and old growth were identified as issues that were used to develop an alternative to the proposed action.

Road Construction

Several scoping comments expressed concerns that road construction and subsequent use could negatively affect water quality through sediment delivery to streams, or would create ideal conditions

17 As used in the Council on Environmental Quality's guidelines for implementing NEPA, the term 'controversial' refers to whether substantial dispute exists as to the size, nature, or effects of the major federal action. Controversy is one intensity factor to determine significance (40 CFR 1508.27).

for weed establishment. The commenters encouraged minimizing or eliminating construction of both temporary and system roads. To address this concern, alternative 3 was developed to exclude new road construction. The action alternatives differ by the miles of specified road construction, and the miles of new temporary road construction.

Old Growth

Several scoping comments identified concerns about managing and retaining old growth in the project area, specifically requesting a 20-25 percent retention level of old growth for wildlife. Alternative 3 was developed to address the concerns for managing and retaining old growth in the Flint Foothills area. Alternative 3 retains all existing old growth in a multi-storied condition; no understory thinning would occur in old-growth stands. This is in contrast to the proposed action, which thins the understory of 121 acres in existing old growth, retaining the old growth in a single-storied stand condition. Both action alternatives retain all of the existing old-growth acres within the project area.

Providing old growth at a prescribed level (e.g. the suggested 20-25 percent recommendation) can be done if old growth exists at that level in the project area. Forest Plan Standard 1 for Vegetation states: Mechanical vegetation treatments and prescribed fire in old growth stands (see FP Glossary) do not reduce the age and number of large trees and basal area below the ‘minimum criteria’ required for Eastern Montana old growth in Green et al, table 3. Removing hazardous fuels within old growth stands is allowed if conducted in a manner that meets this requirement. This requirement does not apply to hazard tree removal and other public safety needs. FP, p. 44).

Comments Addressed through Project Design

Whitebark Pine

Include an alternative that excludes burning in the presence of whitebark pine regeneration: One scoping comment requested an alternative that excludes burning in the presence of whitebark pine regeneration, and that ‘day-lighting’ of seedlings and saplings be an alternative method to the use of prescribed fire. ‘Day-lighting’ is directional falling of competing conifer trees around whitebark pine; in essence, thinning around whitebark pine trees. Whitebark pine is known to occur in three proposed mid-elevation units (Units 3B. 4B and 5B), based on formal surveys.

Specific design criteria were added to exclude prescribed burning in the presence of whitebark pine regeneration. A project design feature was created for hand felling of conifers prior to prescribed fire activities to facilitate underburning; areas with concentrations of whitebark pine would be avoided. Additionally, ignition patterns would avoid the use of fire directly in areas where whitebark pine occurs in groups or clumps. This would provide a means of protecting both live mature trees and established whitebark pine regeneration, and would create favorable ecological conditions for regeneration on extensive areas of existing whitebark pine, without the effects of fire. While there is potential for individual whitebark pine trees to be killed with prescribed burning treatments, the resulting canopy openings would be conducive for seeding by Clarks nutcrackers.

Spread of Invasive Plants

Provide an alternative that eliminates units that have invasive plant species present on roads within units from fire management proposals: All proposed treatment units and access routes were surveyed in 2011for presence of invasive plants[18]. Based on these surveys, there are no prescribed burn units that have invasive plants present along roads within the units.

Units 2B and 7B have a moderate amount of spotted knapweed (*Centaurea maculosa*) populations (estimated 4-7 acres). Three other units have small infestations (0.01 acre or less): Unit 5B has a small infestation of yellow toadflax (*Linaria vulgaris*) adjacent to NFS Road 5167, which serves as the unit boundary; and units 6B and 8B have small (0.01acre) infestations of spotted knapweed along NFS roads 78493 and 8615, respectively, which serve as the unit boundaries. A project design feature was created to aggressively treat prescribed burn units containing invasive plant species following prescribed fire activities. The invasive plants would be controlled following procedures in the Noxious Weed Control Program Record of Decision for the Beaverhead-Deerlodge National Forest (USDA Forest Service 2002, appendix H). A map of the 2011 survey findings of all of the units and access roads is found in the Invasive Plant section, figure 25.

Provide an alternative that includes land management standards that will prevent new invasive plant species infestations by addressing the causes of weed infestation: Invasive plant design criteria and mitigation measures have been incorporated into the alternatives to ensure an overall low risk of invasive plant establishment and spread from proposed actions. These practices comply with existing law, Executive Order, and Forest Service policy as discussed in the Invasive Plants section of this EIS. The alternatives apply the policies and procedures in a site-specific manner to minimize the likelihood of invasive plant establishment and spread during project implementation.

18 To simplify terminology for this statement, all noxious weed and invasive plant species will collectively be called invasive plants. This will include all the species listed on the Federal and Montana Noxious Weed lists as well as cheatgrass (*Bromus tectorum*) and musk thistle (*Carduus nutans*).

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Chapter 2. Alternatives, Including the Proposed Action

Introduction

This chapter describes and compares the alternatives considered for the Flint Foothills Vegetation Management Project. It includes a description of each alternative (including the no action), and presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice by the decision maker and the public. Some of the information used to compare the alternatives is based on the issues (i.e., acres of thinning old-growth understories versus not thinning old-growth understories) and some of the information is based on the environmental, social and economic effects of implementing each alternative (i.e., the effect to old-growth stands in the short and long term, with and without commercial thinning.).

Alternatives Considered in Detail

The Forest Service developed three alternatives, including the no action (alternative 1), the proposed action (alternative 2), and alternative 3, developed in response to road construction and old growth issues raised during scoping by the public.

Alternative 1 – No Action

Under the no-action alternative, no salvage of lodgepole pine by clearcut harvest, commercial thinning, seed tree harvest, prescribed burning, or precommercial thinning would be implemented to accomplish project and Forest Plan objectives.

Alternative 2 – Proposed Action, and Alternative 3

Vegetation Treatments Common to the Action Alternatives

Alternatives 2 and 3 differ by the number of units and total acreages for salvage by clearcut harvest, and commercial thinning of ponderosa pine and Douglas-fir stands. There is no difference in treatment acres between the alternatives for seed tree harvest, prescribed burning and precommercial thinning treatments.

Table 5. Comparison of vegetation treatment acreage and number of units for Alternatives 2 and 3

Vegetation Treatment	Alternative 2 (Proposed Action) Acres	Alternative 3 Acres	Difference in Acres	Alternative 2 Number of Units	Alternative 3 Number of Units	Difference in Number of Units
Salvage by clearcut harvest	1,163	1,022	141	30	25	5
Commercial thinning	1,149	666	483	29	24	5
Seed tree with reserves	353	353	0	6	6	0
Prescribed burning	1,990	1,990	0	8	8	0
Precommercial thinning	1,048	1,048	0	20	20	0
Total Acres	**5,703**	**5,079**	**624**	**88**	**83**	**10**

Salvage of Lodgepole Pine Stands by Clearcut Harvest

Dead and dying lodgepole pine (from 4 inches up to 20 inches d.b.h.) would be salvaged by clearcut harvest. All other species would be retained. Most of the lodgepole pine that is currently alive is expected to be dead or dying by the time the project is implemented. All trees (alive or dead) greater than 20 inches d.b.h. would be retained in all units to meet Forest Plan snag retention standards (Forest Plan, p. 48). Additional snag and live tree retention information to meet snag standards is provided in table 17.

Commercial Thinning of Ponderosa Pine and Douglas-fir Stands

Ponderosa pine and Douglas-fir stands would be commercially thinned. The large-diameter ponderosa pine trees are infested by western and mountain pine beetle; and the Douglas-fir trees are affected by Douglas-fir bark beetles. Not all of these stands are pure ponderosa pine/Douglas-fir type and contain a component of lodgepole pine infected with mountain pine beetle, which would also be harvested. Light underburning after commercial thinning would target understory trees left after harvest to lower stand densities. All trees (alive or dead) greater than 20 inches d.b.h. would be retained in all units to meet Forest Plan snag retention standards (Forest Plan, p. 48). Additional snag and live tree retention information to meet snag standards is provided in table 17.

Seed Tree Harvest

A seed-tree harvest would be implemented in Douglas-fir and ponderosa pine stands to create an early seral component of each species, leaving large diameter ponderosa pine and Douglas-fir as seed trees. Five to 15 trees per acre across the treatment unit would be retained as seed trees. The seed tree harvest would remove much of the understory; light underburning would further reduce understory trees left after harvest. Collectively, these actions would reduce stand density, which would lower the hazard for mountain pine beetles on the remaining ponderosa pine. Some stands contain a component of lodgepole pine infected with mountain pine beetle, which would also be harvested. All trees (alive or dead) greater than 20 inches d.b.h. would be retained in all units to meet Forest Plan snag retention standards (Forest Plan, p. 48). Additional snag and live tree retention information to meet snag standards is provided in table 17.

Prescribed Burn of Mid-elevation Lodgepole Pine and Low-elevation Douglas-fir and Ponderosa Pine Stands

Prescribed fire would be used on mid-elevation lodgepole pine and low-elevation Douglas-fir and ponderosa pine stands to reduce stand densities and create a mosaic of age classes.

Prescribed burning would use either aerial ignition (for mid-elevation burns) or hand lighting (both mid-elevation mixed-intensity and understory light-intensity burns). Burning would occur in either the spring or fall when weather and ground conditions are suitable to maintain air quality, and burning can be controlled. Ignitions may occur over multiple years.

In low-elevation Douglas-fir and ponderosa pine stands, low-intensity understory burns would occur across all acres.

In mid-elevation lodgepole pine stands, mixed-intensity fires would be ignited on approximately 40 percent of the unit. Up to 10 percent of each unit would have small-diameter (4 to 12 inches d.b.h.) conifers cut down. Slash created as a result of these activities would be strategically located to facilitate a mosaic of mixed-severity burned areas. Ignition patterns would be designed so that the concentrations would burn with fire carried into the crown of the

trees for areas up to 20 acres in size, with the objective of mortality in 50 percent of the overstory trees within the unit. Fire would not be carried throughout the unit. The unburned portions of the units would primarily include riparian areas.

The mosaic stand conditions created by the prescribed fire are described in the Desired Condition section of the Vegetation section, p.82.

Precommercial Thinning of Lodgepole Pine and Douglas-fir Stands

Precommercial thinning would treat naturally regenerated, previously harvested stands in 20 units. Retaining ponderosa pine, Douglas-fir and then lodgepole pine (in order of preference) would enhance species diversity improving long-term resiliency of these stands. Trees would be thinned to a 9-foot to 16-foot spacing (500 to 300 trees per acre).

Logging Systems

Treatments would generally be accomplished with conventional, ground-based timber harvest equipment such as rubber-tired skidders, and would be limited to slopes less than 35 percent. Cable logging systems would be used where slopes are greater than 35 percent.

Trees would be whole tree logged and skidded to central landing areas adjacent to roads where they would be processed into logs and loaded on trucks for transport to area sawmills. Unmerchantable material brought to the landing would be piled for chipping or burning. Burning would occur when weather and ground conditions are suitable to maintain air quality, and burning can be controlled.

Haul Routes

Existing Forest roads,[19] National Forest System (NFS) roads and unauthorized routes (UR) would be utilized as haul routes. The total mileage varies by alternative. Figure 3 displays the common haul routes that would be used outside of the project area.

All unauthorized routes currently exist on the ground. The open unauthorized routes are currently open to public motor vehicle travel, and displayed on the Beaverhead-Deerlodge National Forest North Map 2010 as open roads, consistent with the Forest Plan. The closed unauthorized routes are currently closed to public motor vehicle travel, and are not displayed on the Beaverhead-Deerlodge National Forest North Map 2010. Physically, the existing and closed routes are similar. Two unauthorized routes, UR8-260 (open) and UR8-253 (open and closed segments) would be added to the Forest transportation system and would be managed as maintenance level 2 roads (high clearance vehicles recommended).They are designated as "NFS road proposed" on the summary tables and alternative maps. Route UR8-260 accesses private land; all of UR 8-253, including the closed section, is currently displayed on the Beaverhead-Deerlodge National Forest North Map 2010 as an open road. The routes and mileages for the other unauthorized routes proposed for use, both open and closed are provided in the alternative descriptions.

Temporary roads constructed for project use would be decommissioned following project implementation of authorized activities, consistent with Forest Service policy (FSM 7703.24), which states that temporary roads are to be decommissioned. Decommissioning is an activity

19 A Forest road is wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization of the National Forest System and the use and development of its resources.

that results in stabilization and restoration of unneeded roads (or trails) to a more natural state (FSM 7705). The roads would be closed with a combination of signs and berms to allow for a subsequent travel management planning effort to consider these routes for addition to the system or more physical methods of decommissioning such as obliteration. The road-specific decommissioning methods for both alternatives are displayed in table 6.

Road maintenance or reconstruction would occur on the haul route portions of all National Forest System roads (NFSR) and forest roads associated with the project, either during or prior to commercial harvest activities. The unauthorized routes would be reconstructed. These activities would bring the roads to a standard complying with Best Management Practices (BMPs) and also allowing for safe product removal. Road maintenance typically involves grading, drainage features such as culverts, ditches, drainage dips, and spot surfacing as needed to meet BMPs. Reconstruction activities would include the maintenance items as well as more significant roadway improvement and/or realignment: embankment and slump repair, curve widening, subgrade boulder or cobble excavation and removal, and upgrades to accommodate safe timber haul. Timing of project activities would comply with existing travel management direction unless modified by the responsible official for implementation.

Table 6. Decommissioning methodology for unauthorized routes

Previous Route Inventory ID*	Map Designation	Pintler Travel Analysis Comments	Decommissioning Method
UR8-271	UR8-271 Temporary, on open UR (Alt 2 only)	"not needed - low use"; low risks and values except for moderate wildlife/plant and heritage risks	close with sign, natural revegetation
UR8-270	T-26 Temporary, on closed UR (Alt 2 only)	"not needed - low use"; low risks and values except for moderate wildlife/plant and heritage risks	close with sign, natural revegetation
UR8-284	T-28 Temporary, on closed UR (Alt 2 only)	"may be scheduled for obliteration under timber sale"; low risks and values except for moderate wildlife/plant	restore to current condition, rip & disguise (obliterate) entrance
UR8-246	UR8-246 Temporary, on open UR	“private land has other access and area is a yearlong closure"; moderate private access value, wildlife/plant risk and heritage risk, otherwise low risks and values	close with sign, natural revegetation
UT8-110	UT8-110 Temporary, on open UR (Alt 2 only)		close with sign, natural revegetation
UR8-257	T-32 Temporary, on closed UR (Alt 2 only)	"not needed for resource management, low rec use"; moderate heritage risk, otherwise low values and risks	close with sign, natural revegetation
	T17 Temporary, on closed UR		block road/sign; remove drainage; recontour drainages at structures being removed; after all treatments including prescribed burning

Previous Route Inventory ID*	Map Designation	Pintler Travel Analysis Comments	Decommissioning Method
	T-19 Temporary, on closed UR		close with sign, natural revegetation
	T-24 Temporary, on closed UR		close with berm, natural revegetation
	T-34 Temporary, on closed UR		close with sign, natural revegetation
	T-35 Temporary, on closed UR		close with sign, natural revegetation

* Not all unauthorized routes were previously inventoried and assigned route numbers.

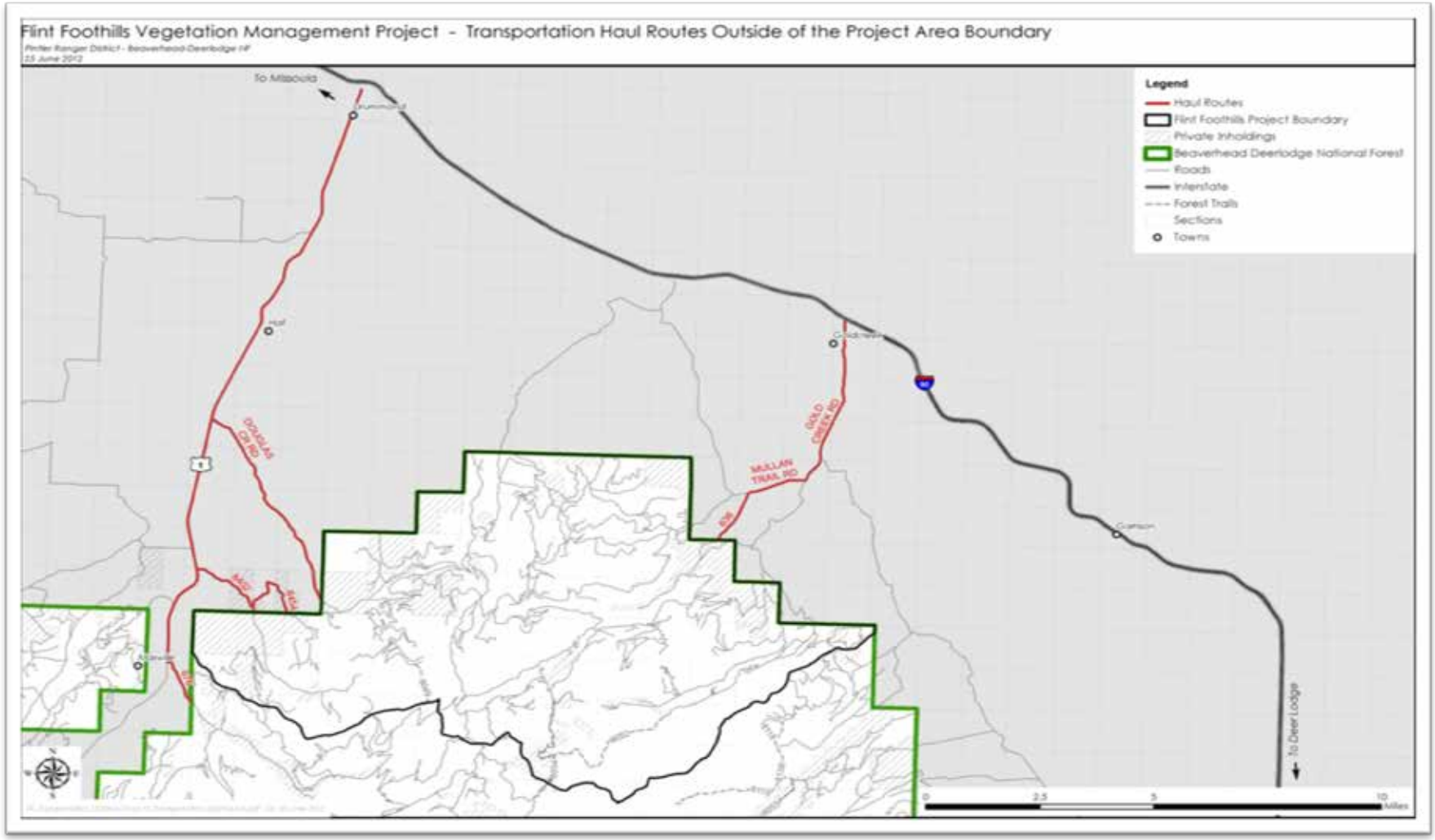

Figure 3. Haul routes located outside of the project area boundary

Alternative 2 - Proposed Action

The proposed action utilizes the full range of several silvicultural treatments described in the previous section to meet the purpose and need for action. Table 7 displays the proposed vegetation treatments. Figure 4 displays the location of proposed activities for alternative 2 followed by treatment- and unit-specific details. Collectively, the commercial vegetation treatments would provide 16,042 MBF (32,083 CCF) in sawtimber; and 4,010 MBF (8,021 CCF) in non-saw timber.

Table 7. Proposed action vegetation treatments, acres of treatment, number of units and range of unit size by acres

Vegetation Treatment Type	Acres of Treatment	Number of Units	Range in Unit Size by Acres
Salvage by clearcut harvest dead and dying lodgepole pine (S): Salvage harvest dead and dying LP. Retain all other conifers and FP required snags.	1,163	30	2-94
Commercial thin ponderosa pine and Douglas-fir (C): Thin low to mid-elevation units to reduce density from an average of 100-140 to 40-60 basal area.	1,149*	29	9-175
Seed tree with reserves (ST): Seed tree harvest for ponderosa pine regeneration. Reserve trees are larger diameter Douglas-fir and ponderosa pine, in addition to seed trees.	353	6	8-139
Prescribed burning (B): Use ignited fire to burn in mid-elevation mixed conifer units and low elevation dry forest units.	1,990	8	15-710
Precommercial thin (P): Thin sapling-sized trees in old harvest units.	1,048	20	9-187
Total	**5,703**	**93**	**2-710**

* Includes 121 acres of old growth in 4 units

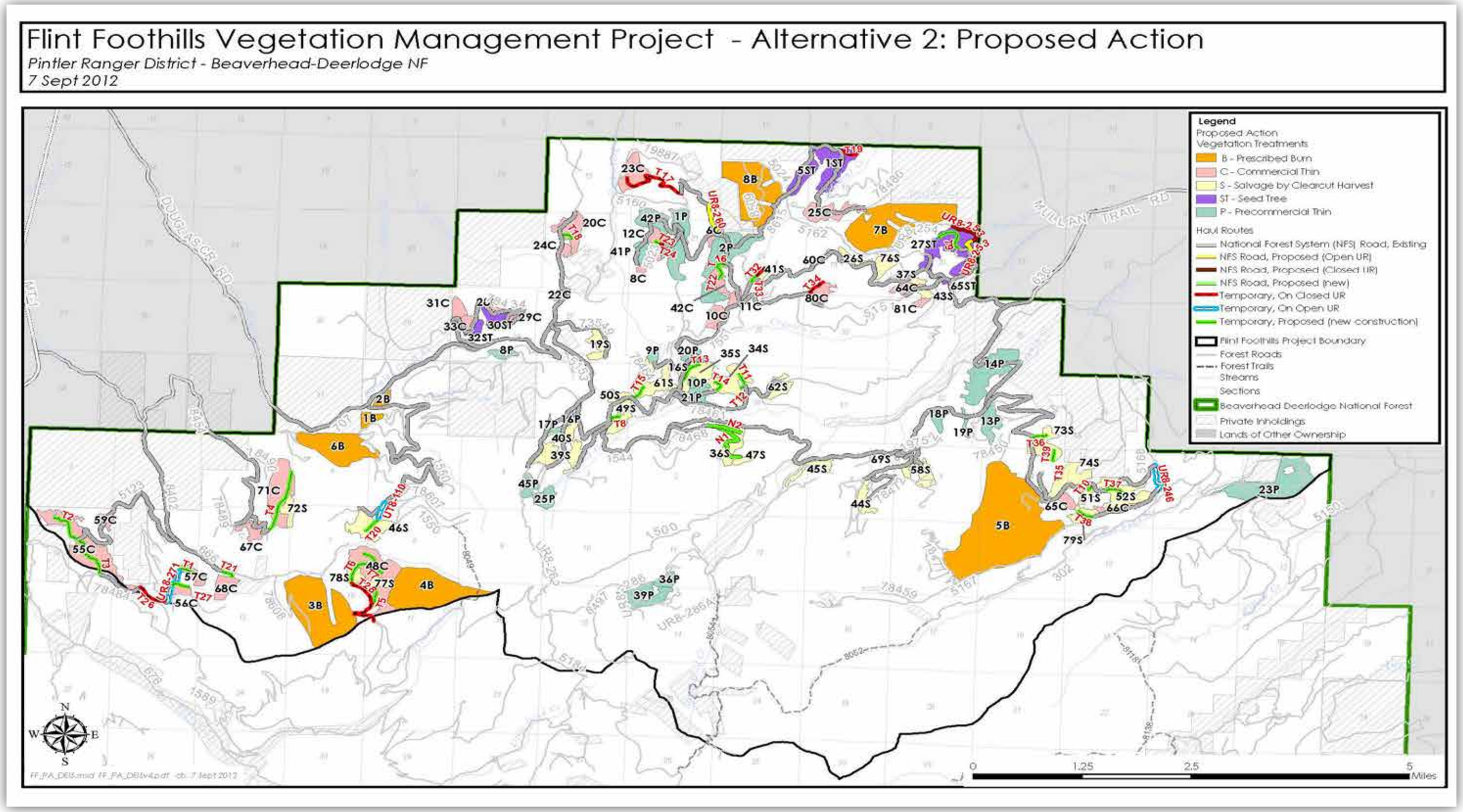

Figure 4. Proposed activities for alternative 2-proposed action

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Vegetation Treatments – Commercial Harvest

Salvage of Lodgepole Pine Stands by Clearcut Harvest

Dead and dying lodgepole pine would be salvaged by clearcut harvest on 1,163 acres. Salvage harvest would occur on 26 units ranging in size from 2 to 94 acres.

Twelve proposed lodgepole pine salvage units (19S, 34S, 35S, 36S, 39S, 46S, 49S, 52S, 58S, 61S, 73S, and 74S) exceed 40 acres in size, ranging from 41 to 94 acres (table 9). Forest Plan timber standard 2 (Forest Plan, p. 39) allows openings created by one regeneration unit to exceed 40 acres on lands suitable for timber production when a natural event created an undesirable opening. This requires public notification and Regional Forester approval.

Commercial Thin of Ponderosa Pine and Douglas-fir Stands

Twenty-nine ponderosa pine and Douglas-fir stands would be commercially thinned on 1,149 acres, with the 29 units ranging in size from 9-175 acres. A total of 121 acres of old-growth stands are included in four commercial thin treatment units (6C, 23C, 25C and 55C); thinning these areas would meet minimum criteria for old growth after treatment, consistent with Forest Plan standards (Forest Plan, p.44).

Light underburning after commercial thinning would reduce understory vegetation not removed during harvest to lower stand densities. The commercial thin units that contain old-growth stands would be excluded from burning.

Seed Tree Harvest of Douglas-fir and Ponderosa Pine Stands

Douglas-fir and ponderosa pine stands would be seed tree harvested on 353 acres within 6 units ranging in size from 8 to 139 acres.

Light underburning after the seed tree harvest would reduce the understory vegetation not removed during harvest to lower stand densities.

Three proposed seed tree units exceed 40 acres in size (units 1ST, 5ST, 27ST). Forest Plan timber standard 2 (Forest Plan, p. 39) allows openings created by one regeneration unit to exceed 40 acres on lands suitable for timber production when a natural event created an undesirable opening. This requires public notification and Regional Forester approval

Logging Systems

Temporary roads and landings constructed within the units would reduce yarding distances. External yarding distances[20] would range from 250-1,600 feet with an average external yarding distance of 999 feet.

Approximately 110 acres of commercial harvest using cable logging systems in units 26S, 36S, 28C, 29C, 33C, 28CS, 60C, 68C and 30ST would occur on slopes greater than 35 percent.

Haul Routes

Under alternative 2,109.1 miles of road would be used as haul routes. Table 8 identifies the roads and associated mileages. Figure 5 displays the haul routes proposed inside the project area boundary.

20 External yarding distance is the slope distance from the landing to the furthest reachable point within the treatment unit boundary.

- A total of 100.6 miles of existing roads, including unauthorized routes, would be utilized as haul routes. This includes 68.2 miles within the project area boundary that are displayed on the alternative 2 map (figure 4) and the transportation map (figure 5). The remaining 26.9 miles are private, county, and NFS road outside the project area. Approximately 58.9 miles would be maintained, and 41.7 miles would be reconstructed.
- Approximately 1.3 miles of new road would be constructed for haul to access units 36S and 47 S. The site conditions require the need for specified road construction, as opposed to temporary road. These roads would be added to the Forest transportation system as NFS road. They would be put into storage (maintenance level 1) for future access following implementation of the Flint Foothills project. These roads would be closed to motor vehicle use during the time they are in storage.
- Approximately 7.2 miles of new temporary road would be constructed, utilizing construction measures such as outsloping, drainage dips, and water-spreading ditches. Following completion of the vegetation projects, the new temporary roads would be decommissioned by obliteration, in which the road prism is recontoured; cut and fill slopes are restored to natural grades; and slash, stumps, and woody debris are placed on top of the corridor to effectively block vehicle travel
- Approximately 4.4 miles of existing open and closed unauthorized routes would be reconstructed. Following implementation, these routes would be decommissioned by various methods, as displayed in table 6, previously.
- Just over 1 mile of open and closed unauthorized routes would be reconstructed, utilized as haul routes and added to the Forest transportation system. They would be managed as maintenance level 2 roads (high clearance vehicles recommended).

Table 8. Haul route mileage summaries for alternative 2

Haul Routes	Alternative 2-Proposed Action Miles	Road/Route Numbers
Forest roads and NFS roads, existing (outside of the project area)	26.9	State Highway 1 Forest Road 676 (Finley Basin Road). NFS Road 1500 (Eureka Ridge Road) NFS Road 8402 (Gird Creek Road) Douglas Creek Road Forest Road 8454 (East Gird Creek) NFS Road 8454 Gold Creek and Mullan Trail Roads Forest Road 636 (Gold Creek)
NFS roads, existing (inside of the project area)	68.2	NFS roads: 1522, 1522A, 1544, 1550, 1557, 1589, 19752, 5023, 5123, 5151, 5152, 5153, 5160, 5161, 5162, 5167, 5168, 636, 666,707, 73549, 78434, 78442, 78461, 78462, 78463, 78464, 78468, 78469, 78470, 78472, 78475, 78476, 78480, 78484, 78489, 78494, 78617, 8402, 8454, 8506, 8510, 8615
NFS roads, proposed (open UR)	0.7	UR8-253 UR8-260
NFS road, proposed (closed UR)	0.4	UR8-253

Haul Routes	Alternative 2-Proposed Action Miles	Road/Route Numbers
NFS road, proposed (new construction)	1.3	N1, N2
Temporary road (on open UR)	1.0	UT8-110 UR8-246 UR8-271
Temporary road (on closed UR)	3.4	T17, T19, T24, T26 (UR8-270), T28 (UR8-284), T32 (UR8-257), T34, T35 (78422)
Temporary road, proposed (new construction)	7.2	T1-T16; T18; T20-T23; T27; T33; T36-T39
Total Miles	**109.1**	

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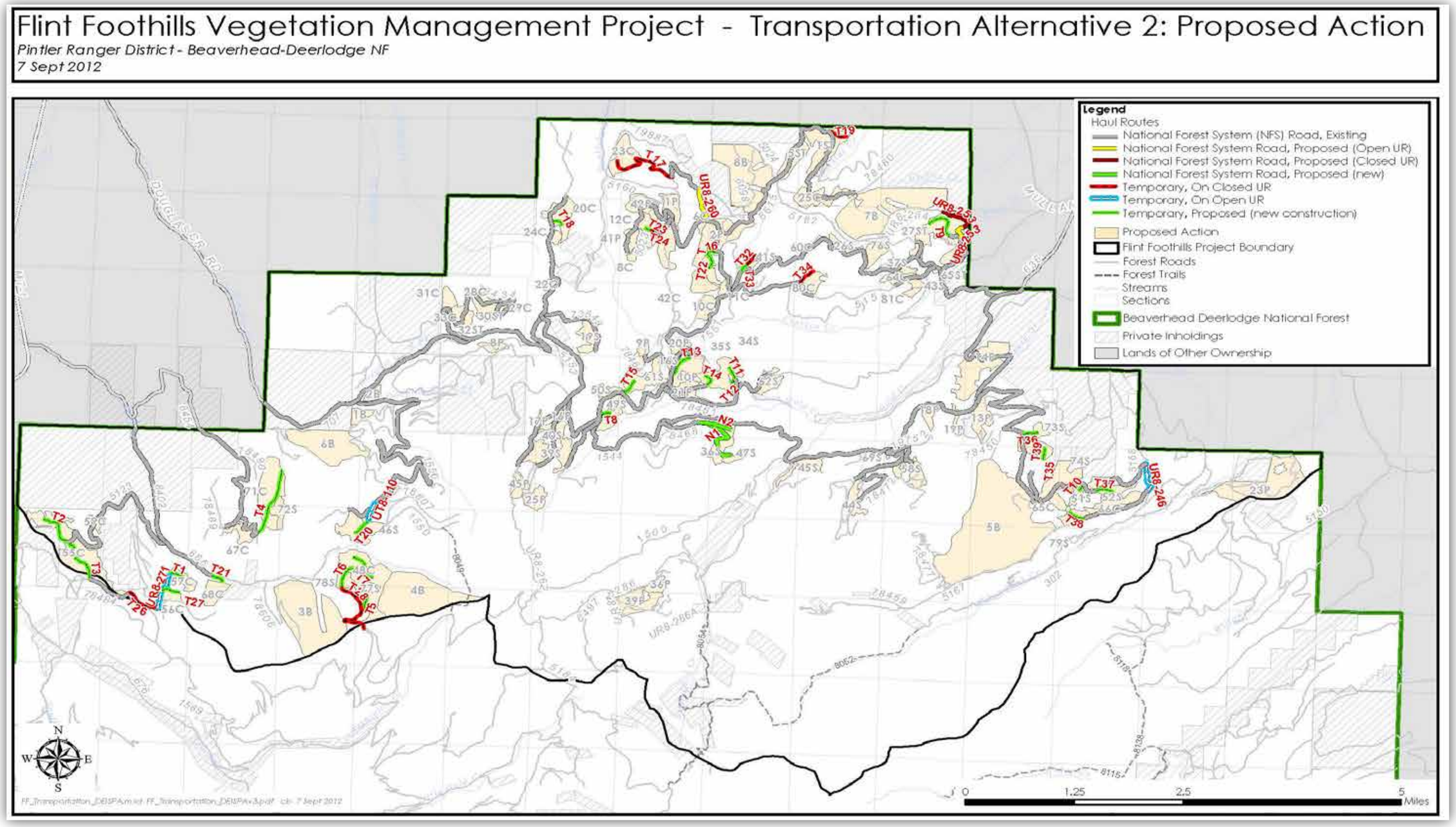

Figure 5. Proposed transportation system for alternative 2-proposed action

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Unit Summaries

Table 9 displays the acres of proposed salvage by clearcut, commercial thin, and seed tree harvest by unit. It also displays the associated logging system(s), temporary road haul route mileages, and limited operating periods and the rationale for the restrictions. The project design features and mitigation measures in chapter 2 identify other implementing restrictions based on environmental conditions, i.e. soil conditions. Table 10 and table 11 display the acres of proposed prescribed burning and precommercial thinning respectively. The alpha code associated with each unit number in the following tables and on the alternative maps represents the treatment type: S = salvage by clearcut; C = commercial thinning; ST = seed tree with reserves; B = prescribed burn; and P = precommercial thinning.

Table 9. Alternative 2 proposed salvage by clearcut, commercial thinning, and seed tree treatment units with LOPs (Units greater than 40 acres requiring Regional Forester approval are highlighted)

Alternative 2 (Proposed Action)					
Unit number	**Acres**	**Tractor Logging Acres**	**Cable Logging Acres**	**Temp Road Miles N = New E= Existing**	**Dates and Reasons that Activities are Restricted (limited operating period)**
Proposed Salvage with Clearcut Harvest Treatment					
16S	7	7			Apr. 1 – June 15 Oct. 15 - Dec. 2 Area closure[2] - Fall secure area[4]
19S	41	41			Apr. 1 – June 15 Oct. 15 - Dec. 2 Area closure[2] - Fall secure area[4]
26S	25	0	25		Oct. 15- Dec. 2 Area closure[2] Fall secure area[4]
34S	78	78		0.42 N	Apr. 1 – June 15 Oct. 15 - Dec. 2 Motorized access on NFS Road 78461 closed[3] - Fall secure area[4]
35S	50	50		0.35 N	Oct. 15 - Dec. 2 Fall secure habitat[4]
36S	61	47	14		Oct. 15 - Dec. 2 Fall secure habitat[4]
37S	8	8			
39S	79	79			Apr. 1 – June 15 Oct. 15 - Dec. 2 Motorized access on NFS Roads 5153, 78469 and 78470 closed[3] Fall secure area[4]
40S	29	29			Apr. 1 – June 15 Oct. 15 - Dec. 2 Motorized access on NFS Road 5153 closed3 Fall secure area[4]
41S	4	4		0.10 N 0.15E	Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4] Motorized access on UR8-257 (T32) closed year round[5]
43S	11	11			April 15-Aug 15[1] Goshawk

Alternative 2 (Proposed Action)					
Unit number	**Acres**	**Tractor Logging Acres**	**Cable Logging Acres**	**Temp Road Miles N = New E= Existing**	**Dates and Reasons that Activities are Restricted (limited operating period)**
					Oct. 15 - Dec. 2 Motorized access on NFS Road 5151closed year round[5]
44S	31	31			Oct. 15 - Dec. 2 Motorized access on NFS Roads 78472, 78475 closed year round[5] Fall secure area[4]
45S	31	31			Oct. 15 - Dec. 2 Motorized access on NFS Road 19755 closed year round [5] Fall secure area[4]
46S	79	79		0.25 N 0.20 E	Oct. 15 - Dec. 2 Motorized access on NFS Roads 1550, 78494 closed[3] Fall secure area[4]
47S	13	13			Oct. 15 - Dec. 2 Fall secure area[4]
49S	43	43		0.16 N	Mar 15 -July 15 Great gray owls[1]
50S	17	17			Apr. 1 – June 15 Oct. 15 - Dec. 2 Area closure[2] - Fall secure area[4]
51S	19	19		0.11 N	
52S	94	94		0.27N 0.39 E	
58S	49	49			Oct. 15 - Dec. 2 Motorized access on NFS roads 19752, 78472, 78476 closed year round[5], Fall secure area[4]
61S	88	88		0.24 N	Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4]
62S	36	36			Apr. 1 – June 15 Oct. 15-Dec. 2 Motorized access on NFS Road 5152 closed[3] - Fall secure area[4]
69S	2	2			Oct. 15-Dec. 2 Motorized access on NFS Road 19752 closed year round [5] Fall secure area[4]
72S	28	28			Oct. 15-Dec 2 Motorized access on NFS Road 8454 closed[3] - Fall secure area[4]
73S	64	64		0.72N	
74S	74	74			
76S	32	32			Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4]
77S	16	16			Sept. 1 – June 15 Oct. 15 – Dec. 2 Motorized vehicle access on NFS Road1500 closed[3] - Fall secure area[4]

Alternative 2 (Proposed Action)					
Unit number	**Acres**	**Tractor Logging Acres**	**Cable Logging Acres**	**Temp Road Miles N = New E= Existing**	**Dates and Reasons that Activities are Restricted (limited operating period)**
					Motorized access on UR8 -284 (T5) closed year round[5]
78S	23	23			Sept. 1 – June 15 Oct. 15-Dec. 2 Motorized vehicle access on NFS Road1500 closed[3] Fall secure area[4] Motorized access on UR8 -284 (T5) closed year round5
79S	31	31		0.21N	
Total	**1,163**	**1,124**	**39**	**3.57 (2.83N) (0.74E)**	
Proposed Commercial Thinning Treatments					
6C	14[6]	14			Apr. 1 – June 15 Oct. 15 – Dec. 2 Area closure[2] - Fall secure area[4]
8C	13	13			Apr. 1 – June 15 Oct. 15 – Dec. 2 Area closure[2] - Fall secure area[4]
10C	31	31			Mar 15-July 15 Great gray owls[1] Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4]
11C	17	17			Apr. 1 – June 15 Oct. 15 - Dec. 2 Area closure[2] - Fall secure area[4]
12C	33	33		0.09 N 0.03 E	Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4]
20C	64	64		0.16 N	Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4] May 15 – August 15 Flammulated owls[1]
22C	16	16			Oct. 15-June 15 Area closure[2] - Fall secure area[4]
23C	69[6]	69		1.04 E	Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4] May 15 – August 15 Flammulated owls[1]
24C	14	14			Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4]

Alternative 2 (Proposed Action)					
Unit number	**Acres**	**Tractor Logging Acres**	**Cable Logging Acres**	**Temp Road Miles N = New E= Existing**	**Dates and Reasons that Activities are Restricted (limited operating period)**
					May 15 – August 15 Flammulated owls[1]
25C	64[6]	64			Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4] May 15 – August 15 Flammulated owls [1]
28C	13	4	9		Oct. 15 – June 15 Area closure[2] - Fall secure area[4]
29C	17	10	7		Oct. 15 – June 15 Area closure[2] - Fall secure area[4]
31C	24	24			Oct. 15 – June 15 Area closure[2] - Fall secure area[4]
33C	18	11	7		Oct. 15 – June 15 Area closure[2] - Fall secure area[4]
42C	31	31		0.37N	Oct. 15 – June 15 Area closure[2] - Fall secure area[4]
48C	157	157		1.09 N 0.94 E	Sept. 1 – June 15 Motorized vehicle access on NFS Road1500 closed[3] Fall secure habitat[4] Motorized access on UR8 -284 (T5) closed year round5
55C	175[6]	175		1.10 N	Mar. 15-July 15[1]. Great gray owls Oct. 15-June 15 Area closure[2] - Fall secure area[4]
56C	18	18		0.22 N 0.81 E	Apr. 15-Aug. 15 Goshawks [1] Oct 15 – Jun 15 Motorized vehicle access on NFS Road 5123 closed[3] Fall secure area[4]
57C	27	27		0.20 N	Apr. 15-Aug. 15 Goshawks[1] Oct 15 – June 15 Motorized vehicle access on NFS Road 5123 closed[3] Fall secure area[4]
59C	20	20			Mar. 15- July 15. Great gray owls[1] Oct. 15-June 15 Area closure[2] - Fall secure area[4]
60C	14	0	14		Apr. 1 – June 15 Oct. 15-Dec. 2

Alternative 2 (Proposed Action)					
Unit number	**Acres**	**Tractor Logging Acres**	**Cable Logging Acres**	**Temp Road Miles N = New E= Existing**	**Dates and Reasons that Activities are Restricted (limited operating period)**
					Area closure[2] - Fall secure area[4]
64C	25	25			Oct. 15-Dec. 2 Motorized access on NFS Road 5151closed year round[5] Fall secure area[4]
65C	18				
66C	24				
67C	33				Oct. 15-June 15 Motorized vehicle access on NFS Road 78489, 8454 closed[3] - Fall secure area[4]
68C	38	20	18	0.17 N	Apr.15-Aug.15 Goshawks[1] Oct. 15-June 15 Motorized vehicle access on NFS Road 666 closed[3] - Fall secure area
71C	122	122		0.87 N	Oct. 15-June 15 Motorized vehicle access on NFS Road 8454 closed[3]- Fall secure area[4]
80C	31	31		0.21 E	Apr. 1 – June 15 Oct. 15-Dec. 2 Motorized access on NFS Road 5151 closed[3] - Fall secure area[4]
81C	9	9			Oct. 15-Dec. 2 Motorized access on NFS Road 5151 closed year round[5] - Fall secure area[4]
Total	**1,149**	**1,094**	**55**	**7.3 (4.27N) (3.03E)**	
Proposed Seed Tree with Reserves (ST)					
1ST	102	102		0.24 E	Mar. 15-Aug.15 Great gray owl[1] May 15-Aug 15 Flammulated owl[1] Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4]
5ST	47	47			Apr. 1 – June 15 Oct. 15 - Dec. 2 Area closure[2] - Fall secure area[4]
27ST	139	139		0.62 E 0.48 N	Apr 15.-Aug.15 Goshawks[1] Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4]
30ST	39	23	16		Oct. 15-June 15 Area closure[2] - Fall secure area[4]

Proposed Seed Tree with Reserves (ST)					
32ST	18	18			Oct. 15-June 15 Area closure[2] - Fall secure area[4]
65ST	8	8			Oct. 15 – Dec. 2 Motorized access on NFS Road 5152 closed year round[5]
Total	**353**	**337**	**16**	**1.34**	

[1] Activities are prohibited during the breeding season (limited operating period); survey prior to implementation if activities are scheduled to occur during the breeding season:

- Goshawk limited operating period is April 15 – August 15; (USFWS R6 2007).
- Great gray owl limited operating period is March 15 – July 15;
- Flammulated owl limited operating season is May 15 – August 15;

[2] Area closed to motorized traffic (Forest Travel map); therefore, the haul routes for the associated units are not open designated routes during these timeframes;

[3] Road closed to motorized traffic (Forest Travel map); therefore, the haul routes for the associated units are not open designated routes during these timeframes;

[4] A project design feature restricts access on existing or proposed roads that would reduce fall secure habitat during the hunting season, October 15 – December 2;

[5] Roads closed year round (Forest Travel map) would have authorized use outside of October 15 – December 2;

[6] Unit contains –old-growth.

Vegetation Treatments – Prescribed Burning and Precommercial Thinning

Prescribed Burning Mid-elevation Lodgepole Pine and Low-elevation Douglas-fir and Ponderosa Pine Stands

Prescribed burning would treat 1,990 acres within eight units ranging in size from 15 to 710 acres: 1,259 acres of mid-elevation lodgepole pine in three units, and 731 acres of low-elevation Douglas-fir and ponderosa pine stands in five units. Table 10 displays the proposed acres of prescribed burning by unit, and distinguishes between the mid and low elevation units.

Table 10. Units and acres of proposed prescribed burning (low and mid elevation) for alternative 2

Proposed Prescribed Burning Treatments (B)		
Units	**Acres**	**Dates and Reasons that Activities are Restricted (limited operating period)[1]**
1B (Low)	22	None
2B (Low)	15	None
3B (Mid)	298	Apr. 1 – June 15; Oct. 15-Dec. 2 Motorized access on NFS Roads 666 and 78608 closed[1] Fall secure areas[2] Sept. 1 – June 15 Motorized access on NFS Road 1500 closed[1]
4B (Mid)	251	Sept. 1 – June 15 Motorized access on NFS Road 1500 closed[1] Fall secure area[2]
5B (Mid)	710	Oct. 15 -Dec. 2 Fall secure area[2]

Proposed Prescribed Burning Treatments (B)		
Units	**Acres**	**Dates and Reasons that Activities are Restricted (limited operating period)[1]**
6B (Low)	164	Oct. 15 -Dec. 2 Fall secure area[2]
7B (Low)	298	Oct. 15 -Dec. 2 Unit in Area closure[3] Fall secure area[2]
8B (Low)	232	Oct. 15-Dec. 2 Unit in Area closure[3] Fall secure area[2]

[1] Road closed to motorized traffic (Forest Travel map); therefore, the access routes for the associated units are not open designated routes during these timeframes;

[2] A project design feature restricts access on existing or proposed roads that would reduce fall secure habitat during hunting season, October 15 – December 2;

[3] Area closed to motorized traffic (Forest Travel map).

Vegetation Treatments—Prescribed Burning and Precommercial Thinning

Pre-Commercial Thin of Lodgepole Pine and Douglas-fir Stands

Precommercial thinning would treat 1,381 acres of naturally regenerated, previously harvested stands in 20units to address the need for density reduction. Table 11 displays the proposed units and acreage for precommercial thinning treatments.

Table 11. Units and acres proposed for precommercial thinning treatment

Proposed Precommercial Thinning Treatments			
Units	**Acres**	**Units**	**Acres**
1P[1,2]	115	19P[2]	12
2P[1,2]	154	20P	24
8P[3]	17	21P[1,2]	49
9P[1, 2]	11	23P [1,2]	187
10P [2]	16	25P [1,2]	35
13P	50	36P	21
14P	138	39P	73
16P[1]	15	41P[1]	24
17P[1]	9	42P [2]	52
18P[2]	23	45P [1,2]	23
Sub-total	**548**		**500**
Total Acres: 1,048			

[1] Area and access road closed to motorized traffic (Forest Travel map) Apr. 1 – June 15; Oct. 15 – Dec. 2;

[2]. A project design feature restricts access on existing or proposed roads that would reduce fall secure habitat during hunting season, October 15 – December 2;

[3]. Area closed to motorized traffic (Forest Travel map) Oct. 15 – June 15.

Alternative 3

Alternative 3 addresses public concerns over new road construction, and logging within old-growth stands. This alternative proposes that no new NFS or temporary roads be constructed to access units or to accommodate logging within units. No commercial thinning would occur within the understory of old-growth stands.

Alternative 3 eliminates eight units (36S, 47S, 72S, 48C, 56C, 57C, 68C, and 71C) requiring new temporary road construction for access to the unit, thereby eliminating the need for new temporary road construction. Six units utilize existing open and closed unauthorized routes to and within the unit to accommodate logging (52S, 73S, 12C, 20C, 23C, and 80C); no new temporary roads would be constructed. Instead, longer skidding distances, which average 1,425 feet, would be utilized to log the unit with ground-based systems. In addition, four units are reduced in size (23C, 25C, 55C, and 6C) by a total of 121 acres to eliminate commercial understory thinning of old-growth stands under alternative 3.

All other vegetation treatment proposals for this alternative are the same as for the proposed action. Collectively, the commercial vegetation treatments would provide 12,686 MBF (25,372 CCF) in sawtimber; and 3,172 MBF (6,343 CCF) in non-saw timber. Figure 6 displays the location of proposed activities for alternative 3. Table 12 displays the vegetation treatment acres.

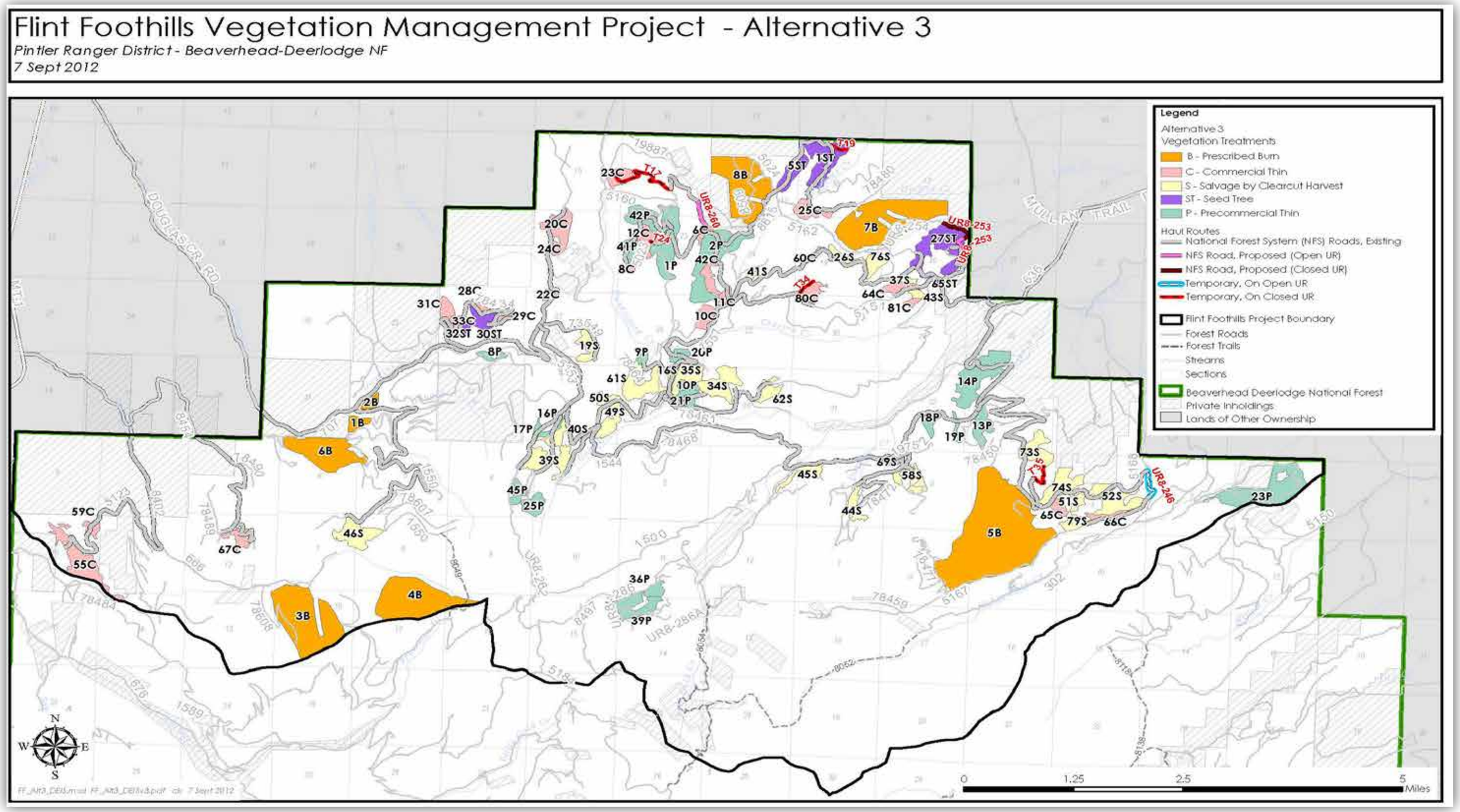

Figure 6. Proposed activities for alternative 3

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Table 12. Alternative 3 vegetation treatments, acres of treatment, number of units and range of unit size by acres

Vegetation Treatment	Alternative 3 Acres	Number of Units	Range in Unit Size by Acres
Salvage by clearcut harvest	666	25	2-94
Commercial thinning	1,022	24	9-118
Seed tree with reserves	353	6	8-139
Prescribed burning	1,990	8	15-710
Precommercial thinning	1,048	20	9-187
Total	**5,070**	**83**	**2-710**

Vegetation Treatments—Commercial Harvest

Salvage of Lodgepole Pine Stands by Clearcut Harvest

Dead and dying lodgepole pine would be salvaged by clearcut harvest on 666 acres. Salvage harvest would occur on 25 units ranging in size from 2 to 94 acres.

Eleven proposed lodgepole pine salvage units (19S, 34S, 35S, 39S, 46S, 49S, 52S, 58S, 61S, 73S, and 74S) exceed 40 acres in size, ranging from 41 to 94 acres (table 14). Forest Plan timber standard 2 (Forest Plan, p. 39) allows openings created by one regeneration unit to exceed 40 acres on lands suitable for timber production when a natural event created an undesirable opening. This requires public notification and Regional Forester approval.

Commercial Thin of Ponderosa Pine and Douglas-fir Stands

Twenty-four ponderosa pine and Douglas-fir stands would be commercially thinned on 1,022 acres, with the 24 units ranging in size from 9-118 acres.

Light underburning after commercial thinning would reduce understory vegetation not removed during harvest to lower stand densities.

Seed Tree Harvest of Douglas-fir and Ponderosa Pine Stands

Douglas-fir stands and ponderosa pine stands would be seed tree harvested on 353 acres within six units ranging in size from 8 to 139 acres.

Light underburning after the seed tree harvest would reduce understory vegetation not removed during harvest to lower stand densities.

Three proposed seed tree units exceed 40 acres in size (1ST , 5ST, 27ST) Forest Plan timber standard 2 (Forest Plan, p. 39) allows openings created by one regeneration unit to exceed 40 acres on lands suitable for timber production when a natural event created an undesirable opening. This requires public notification and Regional Forester approval

Logging Systems

Logs would be skidded to landings located adjacent to existing system roads. External yarding distances would range from 250-4,080 feet with an average external yarding distance of 1,425 feet.

Approximately 78 acres of commercial harvest using cable logging systems, in units 26S, 28C, 29C, 33C, 60C, would occur on slopes greater than 35 percent.

Haul Routes

Under alternative 3, 85.5 miles road would be utilized as haul routes. No new roads would be constructed. Table 13 identifies the roads and associated mileages. Figure 7 displays the haul routes within the project area boundary.

Two open and closed unauthorized routes would be added to the Forest's Transportation system. Other unauthorized routes would be reconstructed, used as haul routes, and then decommissioned following project implementation Refer to table 8 for a detailed listing.

- A total of 85.5 miles of existing roads, including existing unauthorized routes, would be utilized as haul routes. This includes 66.4 miles within the project area boundary that are displayed on the activities for alternative 3 map (figure 6), and on the transportation map for alternative 3, figure 7. The remaining 15.7 miles are private, county, and NFS roads outside the project area. Approximately 47.1 miles would be maintained, and 38.3 miles would be reconstructed.
- Approximately 2.3 miles of existing open and closed unauthorized routes would be reconstructed. Following project implementation, these routes would be decommissioned by various methods, as displayed in table 6.
- Just over 1 mile of unauthorized routes would be utilized as reconstructed, utilized as haul routes and added to the Forest transportation system. They would be managed as maintenance level 2 roads (high clearance vehicles recommended).

Table 13. Haul route mileage summaries for alternative 3

Haul Routes	Alternative 3-Miles	Road/Route Numbers
Forest roads and NFS roads, existing (outside of the project area)	15.7	State Highway 1 Forest Road 676 (Finley Basin Road). NFS Road 1500 (Eureka Ridge Road) NFS Road 8402 (Gird Creek Road) Douglas Creek Road Forest Road 8454 (East Gird Creek) NFS Road 8454 Gold Creek and Mullan Trail Roads Forest Road 636 (Gold Creek)
NFS roads, existing (inside of the project area)	66.4	NFS roads: 1522, 1522A, 1544, 1550, 1557, 1589, 19752, 5023, 5123, 5151, 5152, 5153, 5160, 5161, 5162, 5167, 5168, 636, 666,707, 73549, 78434, 78442, 78461, 78462, 78463, 78464, 78469, 78470, 78472. 78475, 78476, 78480, 78489, 78494, 78617, 8402, 8454, 8506, 8510, 8615
NFS road, proposed (on open UR)	0.7	UR8-253 UR8-260
NFS road, proposed (on closed UR)	0.4	UR8-253
Temporary road (on open UR)	0.4	UR8-246
Temporary road (on closed UR)	1.9	T17. T19, T24, T34, T35 (78442)
Total Miles	**85.5**	

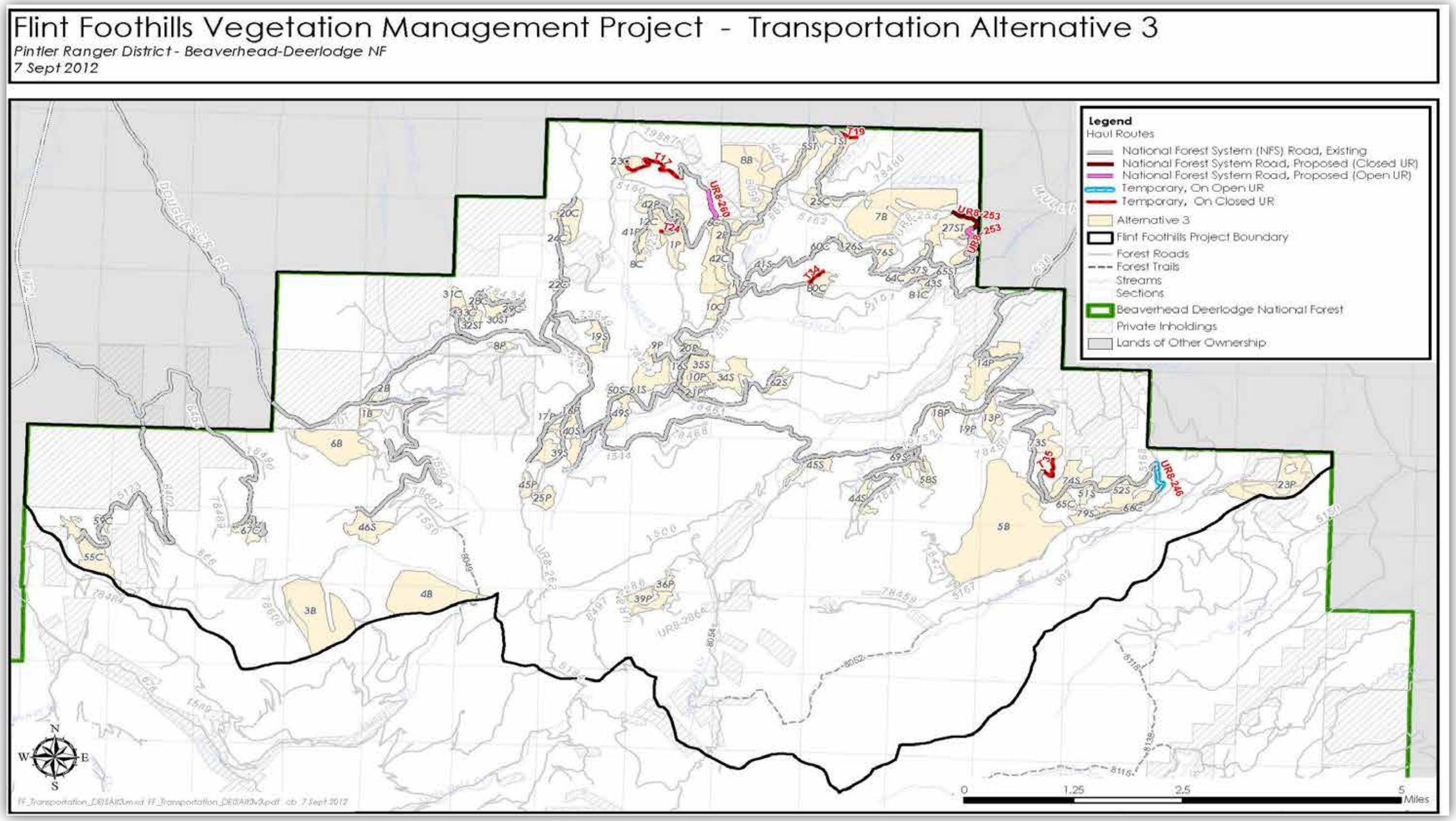

Figure 7. Proposed transportation system for alternative 3

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Unit Summaries

Table 14 displays the acres of proposed salvage by clearcut, commercial thinning and seed tree harvest by unit. It also displays the associated existing unauthorized haul route mileages, limited operating seasons. The project design features and mitigation measures that follow identify other implementation restrictions based on environmental conditions (i.e. soil conditions). Table 15 and table 16 display the acres of precommercial thinning and prescribed burning. The alpha code associated with each unit number in the following tables and on the alternative maps represents the treatment type: S = salvage by clearcut; C = commercial thin; ST = seed tree with reserves; B = prescribed burn; and P = precommercial thin.

Table 14. Alternative 3 proposed salvage by clearcut, commercial thinning, and seed tree treatment units with LOPs (units greater than 40 acres requiring Regional Forster approval are highlighted in gray).

Alternative 3					
Unit Number	**Acres**	**Tractor Logging Acres**	**Cable Logging Acres**	**Open and Closed Unauthorized Route Miles**	**Dates and Reasons Activities are Restricted(limited operating period)[1]**
Proposed Salvage by Clearcut Harvest Treatment					
16S	7	7	0		Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4]
19S	41	41	0		Apr. 1 – June 15; Oct. 15 - Dec. 2 Area closure[2] - Fall secure area[4]
26S	25	0	25		Oct. 15 - Dec. 2 Area closure[2] - Fall secure area[4]
34S	78	78	0		Apr. 1 – June 15 Oct. 15 - Dec. 2 Motorized access on NFS Road 78461 closed[3] - Fall secure area[4]
35S	50	50			Oct. 15 - Dec. 2 Fall secure habitat[4]
37S	8	8			
39S	79	79			Apr. 1 – June 15 Oct. 15 – Dec. 2 Motorized access on NFS Roads 5153, 78469 and 78470 closed[3] Fall secure area[4]
40S	29	29			Apr. 1 – June 15 Oct. 15 - Dec. 2 Motorized access on NFS Road 5153 closed[3] Fall secure area[4.]
41S	4	4			Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4] Motorized access on UR8-257 (T32) closed year round5
43S	11	11			April 15-Aug 15 Goshawk[1] Oct. 15 - Dec. 2 Motorized access on NFS Road

Alternative 3					
Unit Number	**Acres**	**Tractor Logging Acres**	**Cable Logging Acres**	**Open and Closed Unauthorized Route Miles**	**Dates and Reasons Activities are Restricted(limited operating period)[1]**
					5151closed year round[5]
44S	31	31			Oct. 15 - Dec. 2 Motorized access on NFS Roads 78472, 78475 closed year round [5] Fall secure area[4]
45S	31	31			Oct. 15 - Dec. 2 Motorized access on NFS Roads 19755 closed year round [5] Fall secure area[4]
46S	79	79			Oct. 15 - Dec. 2 Motorized access on NFS Roads 1550, 78494 closed[3] Fall secure area[4]
49S	43	43			Mar 15 -July 15 Great gray owls[1]
50S	17	17			Apr. 1 – June 15 Oct. 15 - Dec. 2 Area closure[2] - Fall secure area[4]
51S	19	19			
52S	94	94		0.39	
58S	49	49			Oct. 15 - Dec. 2 Motorized access on NFS Roads 19752, 78472, 78476 closed year round[5] - Fall secure area[4]
61S	88	88			Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4]
62S	36	36			Apr. 1 – June 15 Oct. 15-Dec. 2 Motorized access on NFS Road 5152 closed[3] - Fall secure area[4]
69S	2	2			Oct. 15-Dec. 2 Motorized access on NFS Road 19752 closed year round [5] Fall secure area[4]
73S	64	64		0.38	
74S	74	74			
76S	32	32			Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4]
79S	**31**	**31**			
Total	**1022**	**997**	**25**	**0.77**	
Proposed Commercial Thinning Treatments					
6C	12	12			Apr. 1 – June 15 Oct. 15 – Dec. 2 Area closure[2] - Fall secure area[4]
8C	13	13			Apr. 1 – June 15 Oct. 15 – Dec. 2 Area closure[2] - Fall secure area[4]

Alternative 3					
Unit Number	**Acres**	**Tractor Logging Acres**	**Cable Logging Acres**	**Open and Closed Unauthorized Route Miles**	**Dates and Reasons Activities are Restricted(limited operating period)[1]**
10C	31	31			Mar 15-July 15 Great gray owls[1] Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4]
11C	17	17			Apr. 1 – June 15 Oct. 15 - Dec. 2 Area closure[2] - Fall secure area[4]
12C	33	33		0.03	Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4]
20C	64	64			Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4] May 15 – August 15 Flammulated owls[1]
22C	16	16			Oct. 15-June 15 Area closure[2] - Fall secure area[4]
23C	33	33		1.04	Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4] May 15 – August 15 Flammulated owls[1]
24C	14	14			Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4] May 15 – August 15 Flammulated owls[1]
25C	38	38			Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4] May 15 – August 15 Flammulated owls [1]
28C	13	4	9		Oct. 15 – June 15 Area closure[2] - Fall secure area[4]
29C	17	10	7		Oct. 15 – June 15 Area closure[2] - Fall secure area[4]
31C	24	24			Oct. 15 – June 15 Area closure[2] - Fall secure area[4]
33C	18	11	7		Oct. 15 – June 15 Area closure[2] - Fall secure area[4]
42C	31	31			Oct. 15 – June 15 Area closure[2] - Fall secure area[4]
55C	118	118			Mar. 15-July 15.

Alternative 3					
Unit Number	**Acres**	**Tractor Logging Acres**	**Cable Logging Acres**	**Open and Closed Unauthorized Route Miles**	**Dates and Reasons Activities are Restricted(limited operating period)[1]**
					Great gray owls[1] Oct. 15-June 15 Area closure[2] - Fall secure area[4]
59C	20	20			Mar. 15-July 15. Great gray owls[1] Oct. 15-June 15 Area closure[2] - Fall secure area[4]
60C	14	0	14		Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4]
64C	25	25			Oct. 15-Dec. 2 Motorized access on NFS Road 5151closed year round[5] Fall secure area[4]
65C	18	18			
66C	24	24			
67C	33	33			Oct. 15-June 15 Motorized vehicle access on NFS Roads 78489, 8454 closed[3] Fall secure area[4]
80C	31	31		0.21	Apr. 1 – June 15 Oct. 15-Dec. 2 Motorized access on NFS Road 5151 closed[3] - Fall secure area[4]
81C	9	9			Oct. 15-Dec. 2 Motorized access on NFS Road 5151 closed year round[5] - Fall secure area[4]
Total	**666**	**629**	**37**	**1.28E**	
1ST	102	102		0.24	Mar 15 – July 15 Great gray owl[1] May 15-Aug 15 Flammulated owl[1] Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4]
5ST	47	47			Apr. 1 – June 15 Oct. 15 - Dec. 2 Area closure[2] - Fall secure area[4]
27ST	139	139			Apr 15.-Aug.15 Goshawks[1] Apr. 1 – June 15 Oct. 15-Dec. 2 Area closure[2] - Fall secure area[4]
30ST	39	23	16		Oct. 15-June 15

Alternative 3					
Unit Number	**Acres**	**Tractor Logging Acres**	**Cable Logging Acres**	**Open and Closed Unauthorized Route Miles**	**Dates and Reasons Activities are Restricted(limited operating period)[1]**
					Area closure[2] - Fall secure area[4]
32ST	18	18			Oct. 15-June 15 Area closure[2] - Fall secure area[4]
65ST	8	8			Oct. 15 – Dec. 2 Motorized access on NFS Road 5152 closed year round[5]
Total	**353**	**337**	**16**	**0.24**	

[1] Activities are prohibited during the breeding season (limited operating period); survey prior to implementation if activities are scheduled to occur during the breeding season:

- Goshawk limited operating period is April 15 – August 15; (USFWS R6 2007).
- Great gray owl limited operating period is March 15 – July 15;
- Flammulated owl limited operating season is May 15 – August 15;

[2] Area closed to motorized traffic (Forest Travel map); therefore, the haul routes for the associated units are not open designated routes during these timeframes;

[3;] Road closed to motorized traffic (Forest Travel map)**;** therefore, the haul routes for the associated units are not open designated routes during these timeframes**;**

[4] A project design feature restricts access on existing or proposed roads that would reduce fall secure habitat during the hunting season, October 15 – December 2;

[5] Roads closed year round (Forest Travel map) would have authorized use outside of October 15 – December 2.

Vegetation Treatments—Prescribed Burning and Precommercial Thinning

Prescribed Burning of Mid-elevation Lodgepole Pine and Low-elevation Douglas-fir and Ponderosa Pine Stands

Prescribed fire would treat 1,990 acres within eight units ranging in size from 15 to 710 acres: 1,259 acres of mid-elevation lodgepole pine in three units, and 731 acres of low-elevation Douglas-fir and ponderosa pine stands in five units. Table 15 displays the proposed acres of prescribed burning by unit, and distinguishes between the mid- and low-elevation units.

Table 15. Proposed prescribed burning units (low and mid-elevation) for alternative 3

Proposed Prescribed Burning Treatments (B)		
Units	**Acres**	**Dates and Reasons that Activities are Restricted (limited operating period)[1]**
1B (low)	22	None
2B (low)	15	None
3B (mid)	298	Apr. 1 – June 15; Oct. 15-Dec. 2 Motorized access on NFS Roads 666 and 78608 closed[1] Fall secure areas[2] Sept. 1 – June 15 Motorized access on NFS Road 1500 closed[1]
4B (mid)	251	Sept. 1 – June 15 Motorized access on NFS Road 1500 closed[1] Fall secure area[2]

Proposed Prescribed Burning Treatments (B)		
Units	**Acres**	**Dates and Reasons that Activities are Restricted (limited operating period)[1]**
5B (mid)	710	Oct. 15 -Dec. 2 Fall secure area[2]
6B (low)	164	Oct. 15 -Dec. 2 Fall secure area[2]
7B (low)	298	Oct. 15-Dec. 2 Unit in Area closure[2] Fall secure area[2]
8B (low)	232	Oct. 15-Dec. 2 Unit in area closure[3] Fall secure area[2]
Total Acres: 1,990		

[1] Road closed to motorized traffic (Forest Travel map); therefore, the access routes for the associated units are not open designated routes during these timeframes;

[2] A project design feature restricts access on existing or proposed roads that would reduce fall secure habitat during hunting season, October 15 – December 2;

[3] Area closed to motorized traffic (Forest Travel map).

Precommercial Thinning Lodgepole Pine and Douglas-fir Stands

Precommercial thinning would treat 1,381 acres of naturally regenerated, previously harvested stands in 30 units to address the need for density reduction.

Table 16 displays the proposed units and acreage for precommercial thinning treatments.

Table 16. Units and acres proposed for precommercial thinning treatment

Proposed Precommercial Thinning Treatments			
Units	**Acres**	**Units**	**Acres**
1P[1, 2]	115	19P[2]	12
2P[1, 2]	154	20P	24
8P[3]	17	21P[1, 2]	49
9P[1, 2]	11	23P[1, 2]	187
10P [2]	16	25P[1, 2]	35
13P	50	36P	21
14P	138	39P	73
16P[1]	15	41P[1]	24
17P[1]	9	42P[2]	52
18P[2]	23	45P[1, 2]	23
Sub-total	**548**		**500**
Total Acres: 1,048			

[1]Area and access road closed to motorized traffic (Forest Travel map) Apr. 1 – June 15; Oct. 15 – Dec. 2;

[2]A project design feature restricts access on existing or proposed roads that would reduce fall secure habitat during hunting season, October 15 – December 2;

[3]Area closed to motorized traffic (Forest Travel map) Oct. 15 – June 15.

Project Design Features and Mitigation Measures

The Forest Service developed the following project design features and mitigation measures as part of all of the action alternatives. Both project design features and mitigation measure are incorporated as an integrated part of alternatives 2 and 3, and are nondiscretionary once approved in a decision. They are based upon standard practices and operating procedures that have been employed in similar circumstances and conditions. The line officer and Forest specialists would review project design features and mitigation measures that would be applied through a timber sale contract, prior to contract advertisement.

Project Design Features and Mitigation Measures Common to Alternative 2 and Alternative 3

Vegetation

- In salvage units, lodgepole pine (from 4 inches up to 20 inches d.b.h.) would be salvage clearcut harvested using mechanized ground-based equipment. All other species that occur in the units (Douglas-fir, spruce, subalpine fir, and aspen) would be retained.
- In Douglas-fir commercial thinning units, Douglas-fir stands would be thinned to a density of 40 to 60 square feet of basal area per acre where it exists.
- In the Douglas-fir, ponderosa pine seed tree units, seed trees would be left that are greater than 20 inches d.b.h. and additional trees left to leave 5-15 trees per acre across the unit with the preference being ponderosa pine over Douglas-fir where they exist.
- In Douglas-fir commercial thinning units, and Douglas-fir, ponderosa pine seed tree units, a low intensity understory burn would target reducing understory trees left after harvest to lower stand densities, with fire carried over 60 to 100 percent of each unit. Ignition for the understory burn of harvest units would be by hand-lighting, with the firing operations preferably conducted in the fall; though spring burning would be acceptable.
- In the precommercial thinning units of old harvest units (from the 1960s and the 1970s); the units would be thinned on a variable spacing between 12 and 16 feet apart. The best trees (defined as free growing and full crowned) would be retained; however, where species other than lodgepole pine occur, they would have priority for retention to promote a diversity of species (with the exception of subalpine fir in Douglas-fir and ponderosa pine units).
- Live dwarf mistletoe-infected lodgepole pine within harvest units would be felled to reduce the spread of disease to the new stand. Slash from the trees would be scattered on site or piled and burned at central log landings.
- All trees (live or dead) greater than 20 inches d.b.h. would be retained in all units. An exception would occur in harvest units if they are defined a hazard to harvest operations and designated for felling by a Forest officer.
- All whitebark pine would be retained in all harvest units where it occurs.
- In precommercial thin units, full-crowned trees with green branches down to within 12 inches of the ground would be retained to maintain winter snowshoe habitat (cover and forage).

Prescribed Fire

- In the mid-elevation prescribed fire units, up to 10 percent of each unit would have small-diameter (4 to 12 inches d.b.h.) conifers slashed (cut down). Slash created as a

result of these activities would be strategically located to facilitate a mosaic of mixed severity burned areas with the objective of 50 percent mortality in the overstory trees within the unit. The concentrations would burn with fire carried into the crown of the trees for areas up to 20 acres in size, but fire is not carried throughout the unit. Ignition for the mid-elevation burn units would be a combination of aerial ignition and hand-lighting. Approximately 40 percent of each unit would be targeted with fire ignitions. A spring-time burn would be preferable, when the spread of fire over the ground vegetation would be minimal, but a fall burn would be acceptable.

- Whitebark pine is known to occur in three mid-elevation units (Unit3B, 4B and 5B). The felling of conifers prior to burning activities would avoid areas of units that have concentrations of whitebark pine. Additionally, ignition patterns would avoid the use of fire directly in areas of units that have concentrations of whitebark pine.
- Control lines for the mid-elevation prescribed fire units would principally be natural features that provide adequate fuel breaks. In the Mount Princeton area, Units 3B and 4B would require about 2,000 feet of lightly constructed hand fire-line to control the prescribed fire along the ridge. These lines would be rehabilitated if necessary after activities are complete, and monitored for weed infestations.
- In the low-elevation prescribed fire units, a low intensity understory burn would target reducing understory trees to lower stand densities, with fire carried over 100 percent of each unit. Ignition for the low-elevation burn units would be by hand-lighting, with the firing operations preferably conducted in the fall, though a spring burn would be acceptable.
- Control lines for the low-elevation prescribed fire units would be lightly constructed hand fire-lines and existing road systems. These lines would be rehabilitated if necessary after activities are complete, and monitored for weed infestations.

Air Quality

- All prescribed burning would comply with the State Requirements of the State Implementation Plan and the Smoke Management Plan (USDA Forest Service 1987, pages II-26). Prescribed burning is reported to the Airshed Coordinator on a daily basis. If ventilation problems are forecast by the monitoring unit, prescribed burning is either restricted by elevation or curtailed until good ventilation exists (Story and Dzomba 2005).
- A prescribed burn plan would be completed prior to any burning. The burn plan would address mitigation measures to minimize smoke impacts and to comply with state and Federal air quality regulations.
- Best Available Control Technologies (BACT) would be implemented during prescribed burning operations to limit emissions to the maximum degree that Montana Department of Environmental Quality (DEQ) determines for that source on a case-by-case basis. Techniques and methods may include, but are not limited to: scheduling burn periods, applying dispersion forecasts, fuel preparation and configuration, and limiting the amount of burning, ignition and burning techniques that minimize smoke production.

Harvest Operations

- Harvested trees would be whole-tree yarded to landing sites. Slash and logging debris would be burned or chipped.

- The use of roads that are currently closed and would be opened for harvest access, including unauthorized routes, would be restricted to motorized access by Forest personnel and those involved in vegetation treatment harvest operations.
- All temporary roads on open and closed unauthorized routes and constructed skid trails and landings would be decommissioned upon completion of the authorized activities. Decommissioning the unauthorized routes is consistent with Forest Service policy and would reduce the chance of unauthorized use. The proposed method of the decommissioning would vary by road, as displayed in table 6.
- All newly constructed temporary roads, skid trails, and landings would be obliterated upon completion of harvest operations. Temporary roads would not remain open for post-harvest treatments including reforestation exams and pile burning. Obliterating the temporary roads upon completion of harvest operations would reduce the chance of unauthorized use and allow the reestablishment of vegetation. Obliterating temporary roads would consist of recontouring the road prism, including all cut and fill slopes. Logging slash, stumps, and woody debris would be placed on top of obliterated road corridors to effectively prevent vehicle travel.
- Landings would not be located in natural openings such as meadows or grass-shrub parks, or in riparian areas, to avoid impacts to the vegetation and the introduction and spread of noxious weeds.

Transportation

- Travel restrictions identified on the map titled Beaverhead-Deerlodge National Forest North Map 2010 and the Beaverhead-Deerlodge Forest Plan Record of Decision II Addendum to Travel Route Restrictions would be imposed (table 9 and table 14). Travel during restricted periods would be authorized outside the period Oct. 15 - Dec. 2 for the following NFS roads with year round closures:

  5151 (units 43S, 64C, 80C, and 81C)

  5152 (unit 65ST)

  19752 (unit 69S)

  19755 (unit 45S)

  78472 (unit 58S)

  78475 (unit 44S)

  78476 (unit 58S)

  UR8-257 (T32) (unit 41S)

  UR8-284 (T5) (units 77S, 78S, and 48C)
- Signs, gates, cattleguards and other features damaged or removed during harvest activities would be repaired or replaced.
- Temporary traffic control measures would be implemented for public safety in accordance with Forest Service signing policy and the Manual on Uniform Traffic Control Devices (MUTCD).
- Hazard trees would be felled as necessary to provide for safe use of project haul routes.

Invasive Plant Species

- Invasive plants would be controlled following procedures in the Noxious Weed Control Program Record of Decision for the Beaverhead-Deerlodge National Forest (USDA Forest Service 2002, appendix H) to limit infestation and spread.
- Log landings would be located in invasive plant-free areas. If no such areas are available, the site would be treated prior to use to minimize weed seed production and spread.
- All heavy equipment would have an undercarriage wash and inspection prior to entering National Forest System lands to reduce the spread of invasive plants.
- Slash and chipped material generated from the project can be spread over bare soil. Debris would be placed to deter public motorized vehicle use on landings.
- Disturbed areas as determined by the Forest Service would be monitored to ensure soil stabilization occurs through natural revegetation from the soil seed bank. If additional plant seed is required, only native seed mix approved by the Forest Service would be used. Seed would be broadcast-spread over disturbed areas in the fall of the year, prior to snowfall. Seeded areas would be monitored closely to ensure successful establishment of desired vegetation. All seed and mulch material would be certified noxious weed seed free. In addition, invasive plants would be monitored and treated as necessary to reduce the potential spreading into new areas.
- Piling and burning slash would be avoided on invasive plant infestations. Jack-pot burn pile locations would be monitored and treated as necessary to prevent establishment and spread of invasive plants.
- Prescribed burning would be accomplished in a manner to ensure a low severity burn. This can be accomplished by burning in the spring or fall because fuel and soil moisture are higher during these times of year compared to summer, which would reduce the intensity of the fire. Some mid-elevation lodgepole pine areas would experience a mosaic of mixed-severity burned areas, as designed.
- Prescribed burn units containing invasive plant species would be aggressively treated following prescribed fire.
- Post-activity monitoring for and treatment of invasive plants would occur on all proposed treatment units. Specific emphasis would be given to areas of ground disturbance within the units, and to units with existing infestations where monitoring and treatment would occur until populations are effectively controlled.

Wildlife

- Snag retention standards and their application to this proposal are provided in table 17 that follows. Exceptions would occur in harvest units if the snags are defined a hazard to harvest operations and designated for felling by a Forest officer

Table 17. Snag standards

Forest Plan Wildlife Standard Number 3	Existing Situation	How Direction is Incorporated
Retain all snags greater than 20” d.b.h. (except hazard trees)	Snags greater than 20” d.b.h. are limited in the project area	All trees greater than 20” d.b.h. (live or dead) would be retained. Project design feature.
Do not reduce the number of snags greater than 15.0 “ d.b.h. per acre in treatment units below 8.0 snags per	Snags greater than 15” d.b.h. are limited in the project area.	Within the commercial treatment units, snags would be retained at numbers prescribed by Forest Plan standard 3,

Forest Plan Wildlife Standard Number 3	Existing Situation	How Direction is Incorporated
acre for PICO (lodgepole pine), calculated as an average for the total treatment unit acreage in a project area.		(table 12).
If there are insufficient snags in treatment units, live trees in the same size class must be retained and counted towards the snag requirement.	Expect that there are insufficient snags.	Live trees, larger than 10 inches d.b.h., would be retained for future snag recruitment at 0.9 trees per acre (calculated for the total treatment unit acreage in the project area) consistent with Forest Plan wildlife standards 3 and 4 (table 12 and 13).
These per acre requirements do not apply to the treatment units if analysis shows the levels of snags will be met for the project area as a whole.	Did not do a project area wide snag analysis.	Above requirements apply.
If, in the project area as a whole, there are insufficient live trees and/or snags greater than 15" d.b.h., the standard is deemed complied with by retention of the existing live trees and/or snags greater than 15" in the treatment units.		All live trees greater than 20" d.b.h. would be retained and all snags greater than 15" d.b.h. would be retained. Plan direction is met.

- Large woody debris, at least six pieces per acre with small-end diameter equal to or greater than 8.0 inches and at least 10 feet long, would be retained in salvage clearcut harvest units (lodgepole pine cover types). Large woody debris, at least six pieces per acre with small-end diameter equal to or greater than 12.0 inches and at least 10 feet long, would be retained in commercial thin harvest units (Douglas-fir cover types). Leave trees would be marked for retention, then cut and left following salvage harvest to meet Forest Plan requirements, where needed.
- Existing large diameter logs in various stages of decay would be retained in all treatment units where possible. Methods include placement of slash away from logs to prevent burning and avoiding the logs with equipment to prevent demolishing.

Table 18. Guidelines for protecting nesting and breeding sensitive bird species or species of interest

Species	Breeding Season Limited Operating Period	Nest Buffer
Flammulated owl	May 15 – August 15	35 acres
Black-backed woodpecker	June 1 – August 15	1 acre
Northern goshawk	April 15 – August 15	40 acres
Great gray owl	March 15 – July 15	30 acres

- Goshawks nesting activity was confirmed adjacent to units 56C, 57C, and 68S. These units would be surveyed prior to logging operations if logging and hauling was scheduled during the breeding season (April 15 - August 15).
- A great gray owl was seen in units 10C and 49S, and heard in the vicinity of units, 25C, and 27C. In addition, unidentified owls were heard in Units 55C and 59C. These units

would be surveyed prior to logging operations if logging or hauling was scheduled during the breeding season (March 15-July 15).

- Flammulated owl nest sites have been confirmed adjacent to units 20C, and within unit 23C. In addition, owls were heard or seen in units 24C, and 25C. These units would be surveyed prior to logging operations if logging or hauling was scheduled during the breeding season (May 15-August 15).
- If active nest sites for threatened, endangered, proposed candidate or sensitive birds (including species of interest, northern goshawks and great gray owls) are found, a wildlife biologist would be contacted to identify mitigation based on species needs and site-specific considerations. General guidelines are shown in table 18.
- Travel restrictions identified on the map titled Beaverhead-Deerlodge National Forest North Map 2010 and the Beaverhead-Deerlodge Forest Plan Record of Decision II Addendum to Travel Route Restrictions would be imposed as described under the Transportation section, above. In addition, access on existing or proposed roads that reduce fall secure areas would be restricted during the period of October 15 – December 2 (table 9 and table 14) (Several proposed timber haul routes cross through elk winter range; however, no units are proposed for winter logging).
- Precommercial thin units along roads open during the hunting season would retain more cover along the roads (units 13P, 14P, 16P, 17P 18P, 19P, 20P, 21P, 23P, 36P and 39P).
- In precommercial thin units, full-crowned trees with green branches down to within 12 inches of the ground would be retained to maintain winter snowshoe habitat for cover and forage (units 36P and 39P).
- Prior to implementation of prescribed burning, abandoned mine sites within prescribed burn units 3B, 4B, and 5B would be assessed by a wildlife biologist for potential Townsend's big-eared bat roosting. If the mine site is known to, or appears capable of, supporting maternity or winter roosting by Townsend's big-eared bats, mitigation measures such as management buffers or avoidance of burning during period of occupation would be applied to minimize potential impacts to roosting bats.
- During project implementation, potential bear and other wildlife attractants that include food, trash, oil products and machinery lubricants would be contained in bear-proof containers to prevent wildlife attraction to work sites.

Soils

- Ground-based yarding would not occur on slopes exceeding 35 percent that have not had a site-specific evaluation by a soil scientist determining that damage is unlikely (Forest Plan direction; Soil and Water Conservation Practice (SWCP 14.07)).
- Harvest would not occur unless soils are dry or frozen as determined by the Forest Service in order to minimize potential compaction and/or rutting (SWCP 13.06).
- Timber operations and harvest units would avoid wet areas. The Forest soil scientist, hydrologist, and fisheries biologist would work with the project implementation team to protect these areas (SWCP 13.03).
- Skid trails would be spaced an average of 75-100 feet apart (SWCP 14.08). Skid trails would be adequately drained in order to prevent overland water flow. Slash would be placed on skid trails to prevent erosion and to discourage ATV use (SWCP 14.15). Drainage structures (or slash) would be placed on temporary roads and skid trails that

would be left over the winter to reduce erosion potential during higher flows associated with the spring season (SWCP 14.15). If slash were used for overwinter protection, it would be removed before use or obliteration the following summer.

- Constructed skid trails and newly constructed temporary roads would be obliterated and revegetated with native seed mix approved by the Forest Service (SWCP 15.25).
- A range of 7 to 12 tons per acre of coarse woody debris (3 inches or greater in diameter) would be left in harvest units. This may be accomplished by felling and leaving trees where necessary (USDA Forest Service 1999).
- Landings would be revegetated with native seed and areas of compacted soil would be scarified prior to seeding (SWCP 14.11).
- Slash would be piled and burned on roads where feasible. Where this is not feasible, slash would be piled in such a way (tall and narrow) as to reduce the footprint on the soil and piles would be burned when the soil is cold or frozen and moist.
- Yarded logs would be partially or fully suspended for cable logging systems (SWCP 14.09).
- Sub-soiling would occur within specified units in order to restore portions of the units to ensure compliance with soil quality standards within these units. [21]
- Broadcast and concentration burning would be performed in the fall or spring when soil moisture levels are high (SWCP 18.02).

Hydrology and Aquatic Resources

- Harvest units, landings, temporary roads and timber operations would avoid RCAs.
- Harvest units, temporary roads, timber operations and project activities would avoid known western toad breeding sites and natal areas during breeding and juvenile rearing periods.
- Where culverts are replaced:
    - Work would be conducted during dry conditions, either naturally or via a clear water diversion to further minimize sediment impacts.
    - Streams would be dewatered during culvert removal.
    - Straw bales or other erosion control measures would be in place downstream of activities to help alleviate stream sedimentation.
    - On perennial streams, Montana Streamside Protection Act (SPA) 124 Permits would be obtained for any activity that would disturb stream channels. U.S. Army Corps of Engineers 404/401 permits would be obtained for any activities involving stream channels and/or wetlands.
    - A fish biologist or hydrologist would be notified prior to stream culvert replacements to allow them the opportunity to be present to ensure appropriate alignment and reshaping of the stream channel, bankfull width, floodplain, step-pools and grade control structures, transplants, etc.
    - Road stream crossings would have appropriately sized culverts, capable of passing a 100-year flood event.

[21] Refer to the “Soils Restoration Plan” under project design features and mitigation measures specific to each alternative.

- Temporary roads would have water bars or other appropriate drainage structures. Maximum cross drain spacing would be determined by the road grade using the following formula: 1000 feet divided by the percent grade (i.e., 1000 feet divided by 5 percent grade results in maximum 200-foot spacing).
- The hydrologist or fisheries biologist would be notified by the sale administrator that site conditions in riparian conservation areas (RCAs) warrant snow plowing for operator access and safety.
- Project-related storage of fuels and toxicants within riparian conservation areas would be prohibited. Refueling within riparian conservation areas would be prohibited except for emergencies, in which case refueling sites must have an approved spill containment plan (Forest Plan, p. 21).
- On all haul routes and reconstructed road segments, Montana Best Management Practices (BMPs) for forestry would be met at a minimum on roads used to access treatments, including provisions of the Streamside Management Zone law.
- On all reconstructed road segments:
    - All BMPs would be functional at the close of timber sale activities by subdivision, as displayed on the timber sale map. The timber sale administrator would coordinate with a Forest engineering representative and hydrologist to accomplish BMP surveys. All culverts would be marked by the Forest engineering representative before winter and cleared of debris as needed to keep them functioning. This would help prevent equipment operators from crushing the inlet and outlet of culverts.
    - Snow would not be completely removed. In general, a minimum 4 inches of snow must be left on the roadway during plowing operations to protect the surface of the road.
- Slash filter windrows or an equivalent alternative, would be placed when necessary at stream crossings and maintained to prevent measurable sediment impacts to stream and fish habitats during hauling and road maintenance related to harvest activities. Potential slash filter windrow placement sites would be identified prior to the timber sale appraisal by the forest engineer and fisheries biologist or hydrologist. The following general guidelines would be used for slash filter windrow placement:
    - Apply 100 to 200 feet of windrow to the majority of intermittent and perennial stream crossings.
    - Place where slash is available on site or with minimal haul.
    - Where slash is not immediately available, an alternative filter may be used such as silt fence or straw bales.
    - Locate at the toe of the road fill slope on both sides of the stream and road and extending over the crossing structure.
    - Place on road segments that will receive road blading and reconstruction.
    - Place on major timber haul routes where roads may be susceptible to large traffic volumes and consequent road surface erosion and rutting.
- Where system roads and unauthorized routes are reconstructed, road work would comply with all BMP standards.
- All applicable permits required by State and Federal water quality regulations would be obtained prior to project implementation. At this time it is uncertain whether this project will require a National Pollution Discharge Elimination System (NPDES)

permit for stormwater discharge from logging roads. The Forest Service will comply with any applicable NPDES permitting requirements if determined in the future that it is needed for this project.

- Following burning, landings would be reseeded within one year using native seed mix approved by the Forest Service.
- No ignition of prescribed burning is allowed within riparian conservation areas (RCAs). Burning should occur when soil moisture contents are relatively high to minimize overheating of soils, especially in riparian areas.
- Helispots would be located outside of Riparian Conservation Areas (RCA). Refueling of helicopters in RCAs would be prohibited.

Sensitive Plants

- If undocumented sensitive plant populations were found before or during the project, activities would be halted until avoidance or mitigation measures can be considered by the Forest Botanist.

Recreation

- No log hauling would occur on NFS roads on weekends and federal holidays to provide for public safety.
- The trail surface and signs would be protected from damage from treatment activities in the vicinity of Forest System Trail 8049. If trail surface damage occurs, the surface would be restructured to meet serviceable standards. Damaged signs would be replaced. Slash and burn piles would be located off the trail tread.
- All recreational trails, trailheads, and other recreation facilities (i.e., signs, gates, poster boards, etc.) would be protected during or re-established after activity.
- Dust would be abated in the vicinity of Douglas Creek Cabin if harvest or treatment activities occur while the cabin is open to occupancy during the dry season.
- Roads and trails within Unit 4B may be closed during implementation of the prescribed burns to provide for public safety.

Range

- Natural barriers removed during harvest that serve to block livestock movement between allotments would be replaced with fencing. Range betterment (RBRB) funds would be used to purchase fence materials, and fencing would be completed by the appropriate range permittee(s), or through a contract.
- Existing fences and water development would be protected from damage during project implementation. Damage to infrastructure would be repaired to Forest Service specifications.
- Gates and/or cattleguards would be installed where new roads intersect with fences.

Scenic Resources

- Visible stumps within 100 feet of Concern Level 2 routes should be cut to a maximum stump height of 6 inches. This applies would apply to units with edges that are directly adjacent to the following routes within the project area: NFS roads 707, 1544, 1557 and 636.
- Clearcut units seen from NFS roads1544 and 1557 would have form and shape that simulates natural patterns (i.e., avoiding straight lines and sharp corners). The edges of

such units would be tied into existing meadows and openings where possible, or provide feathering that allows gradual transition into the untreated adjacent forest area (as opposed to an abrupt line). Units that would be seen from NFS road 1544: 36, 45S, 69S, and 37S. Units that would be seen from NFS roads1557: 41S, 35S, 16S, 61S, 50S, 26S, 76S, and 49S.

- Final layout of units seen from the Concern Level 2 routes listed above shall be reviewed by the forest landscape architect prior to implementation.

Heritage

- Sites would be avoided or site-specific mitigation measures would be developed in consultation with the Montana State Historic Preservation Office prior to project implementation.
- Mitigation measures would ensure cultural resources are not impacted by fire in the prescribed burn units and the commercial thin and seed tree unit understory burning. If there is potential to affect a cultural site, additional mitigation measures would be developed in consultation with MT State Historic Preservation Office prior to project implementation.
- Sites with flammable components would be protected, if needed, with the use of mitigation measures prior to implementation including: Exclusion from the treatment area, handlines, blacklines (burning fuels around the site to create a fire break), wet lines, foam retardant, structural fire shelter, or removal of fuels from the site by hand.
- Non-fire sensitive sites, considered to have less risk for fire effects in low-temperature and or light fuel load condition (such as prehistoric and historic sites with deeply buried cultural deposits, prehistoric and historic artifact scatters, and prehistoric and historic sites with non-flammable surface features) that are located within prescribed burn, commercial thin and seed tree units, would be protected, if needed, with the following measures:
    - No staging, parking or use of mechanized equipment would occur within site boundaries.
    - No ignition points would occur within site boundaries.
    - Large diameter trees would be felled away from all features.
    - Thinning within site boundaries would be accomplished using hand tools only.
    - No slash piling would occur within site boundaries.
    - Thinned material would be hand carried outside site boundary.

Project Design Features and Mitigation Measures Specific to Alternative 2 (Proposed Action)

- New temporary road construction and landings would be designed to limit the need for excavation during construction and would be located on slopes less than 35 percent.
- Newly constructed temporary roads would be closed to the public through a forest order. Advance notice and appropriate signs would be used to inform the public of the closures.
- All newly constructed temporary roads would be decommissioned by obliteration upon completion of harvest operations. These roads would not remain open for post-harvest treatments including reforestation exams and pile burning. Decommissioning the temporary roads upon completion of harvest operations would reduce the chance of

unauthorized use. Obliterating temporary roads would consist of recontouring the road prism, including all cut and fill slopes. Logging slash, stumps, and woody debris would be placed on top of temporary road corridors to effectively limit vehicle travel.

Soils Restoration Plan

- For all units with proposed temporary road construction (12C, 20C, 27ST, 34S, 35S, 41S, 42C, 46S, 48C, 49S, 51S, 52S, 55C, 56C, 57C, 61S, 68C, 71C, 72S, 73S, 77S, 78S, 79S) all temporary roads (new construction) would be ripped or subsoiled, seeded with native seed, and blocked at the entrance. Roads would be re-contoured where needed.
- For three units (32ST, 40S, 41S) additional restoration may be required to comply with the regional soil quality standards. In these units existing and new skid trails would be subsoiled to reduce compaction. Restoration activities would focus on skid trails and landings and would occur on suitable acres, excluding areas that are too rocky, wet, or have other limiting factors. Restoration would be implemented on the number of acres needed to meet soil quality standards; actual acres restored may be higher or lower than what is shown in in the soils section. Treatments would occur within three years of completion of harvest.
- Actual acres to be restored would be determined by post-harvest monitoring to determine the actual percent detrimental soil disturbance, from which actual acres to be restored can be calculated. These units would need to be monitored to ensure that SQS are met within 3 years of the conclusion of the project.

Project Design Features and Mitigation Measures Specific to Alternative 3

Soils Restoration Plan

- For three units (23C, 32ST, 40S) additional restoration may be required to comply with the regional soil quality standards. In these units existing and new skid trails would be subsoiled to reduce compaction. Restoration activities would focus on skid trails and landings and would occur on suitable acres, excluding areas that are too rocky, wet, or have other limiting factors. Restoration would be implemented on the number of acres needed to meet soil quality standards; actual acres restored may be higher or lower than what is shown in table 70 in the soils section. Treatments would occur within three years of completion of harvest.
- Actual acres to be restored would be determined by post-harvest monitoring to determine the actual percent detrimental soil disturbance, from which actual acres to be restored can be calculated. These units would need to be monitored to ensure that SQS are met within 3 years of the conclusion of the project.

Monitoring

Silviculture: Monitoring of regeneration success would begin one year after all proposed actions have been implemented (generally late summer to early fall). Monitoring would continue on a schedule of first-, third- and fifth-year exams. By the third year, if exams indicate that natural regeneration is not progressing toward the desired seedling-per-acre goal, planting of seedlings would be considered.

Invasive Plants: Post activity monitoring and treatment would occur as long as necessary to ensure that existing infestations do not expand and new infestations have been controlled. It is

recommended that the units, haul routes, temporary roads, and burn piles be identified as a high priority for funding in the KV Plan to treat existing weed populations.

Soils: Units requiring subsoiling per the soils restoration plan would need to be monitored, at a minimum, to ensure compliance with Region1 SQS since they are predicted to exceed the SQS before restoration. Monitoring should follow the Forest Soil Disturbance Monitoring Protocol (USDA Forest Service, 2009b).

Heritage: A sample of cultural resources in the area of potential effect (APE) would be monitored by a Forest Service archaeologist following project work to ensure that mitigation measures were followed and sites sustained no damage. If sites are damaged, the archaeologist would determine the appropriate actions, which may include data recovery, site stabilization and reporting to insure that similar damage does not occur in the future.

A sample of sites would be re-visited by Forest Service personnel to evaluate the effectiveness of the treated. The purpose of post –treatment monitoring is to gather data that would be used to improve planning for the protection of heritage resources in future projects.

Transportation: Monitoring transportation routes to determine if soil and water conservation practices (BMPs) being implemented during project work and are they resulting in protection of water quality and beneficial uses.

Wildlife: Obliteration of temporary roads would be monitored for effectiveness of eliminating motorized use and revegetating or stabilizing the roadbed.

A portion of units would be monitored for implementation of the design features to retain snags according to Forest Plan standards, and to meet large woody debris requirements.

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Alternatives not considered in detail may include, but are not limited to, those that fail to meet the purpose and need, are technologically infeasible or illegal, or would result in unreasonable environmental harm (FSH 1900.15.14.4).

Public comments submitted during scoping suggested that the number of acres proposed for treatment be increased; that the purpose and need be expanded to include restoration components; or that woodpecker conservation areas be established in areas affected by the mountain pine beetle. These alternatives either fail to meet the purpose and need, or were determined inconsistent with the Forest Plan. Therefore, four alternatives were considered by ID team and responsible official, but not analyzed in detailed pursuant to the direction cited above. The following section describes the rationale.

Provide an alternative that builds flexibility into the analysis to be able to add harvest areas at a later date. A thorough integrated analysis has been done within the project area to include all acres that are appropriate to harvest at this time and in the reasonably foreseeable future. Currently, 100 percent of the lodgepole pine stands have been affected by the mountain pine beetle. All suitable acres were looked at for harvest and presented in the updated proposed action. The number of acres proposed for commercial harvest increased by 343 acres from the June 2010 public scoping effort when 70 percent of the lodgepole pine stands were estimated to

be affected. Adding new acres would include areas that are not accessible or outside of compliance with Forest Plan standards and objectives.

Table 19 shows the comparison of the proposed commercial harvest acreages.

Table 19. Comparison of the commercial harvest acres proposed in 2010 and the current proposed action

Vegetation Treatment Type	Acres of Treatment	
	The 2010 Proposal	Current Proposal
Clearcut salvage dead + dying lodgepole pine	668	1,163
Commercial thinning ponderosa pine and Douglas-fir	1,095	1,149
Combination of clearcut lodgepole pine salvage + commercial thinning	559	0
Seed tree harvest	0	353
Total	**2,322**	**2,665**

We encourage the Forest Service to consider including a watershed or ecosystem restoration alternative for detailed evaluation, or at least to include watershed/ecosystem restoration elements in the reasonable alternatives: Watershed restoration elements would not address the purpose and need of the proposal and are not included in the range of reasonable alternatives. Road maintenance and reconstruction associated with the proposed haul routes, including implementation of Best Management Practices (BMPs) and the use of other mitigation measures would improve road surface conditions and reduce sediment delivery associated with road use and runoff.

We request the FS design a restoration/access management plan for project area streams that will achieve recovery goals. This alternative was not analyzed in detail because it does not meet the purpose and need to manage for the specific vegetation types identified in the proposed action and scoping letter.

Please include an alternative that recognizes the high value of the mountain pine beetle in creating wildlife habitat both in the short and long term, and therefore includes management conservation strategies that incorporate the value of these infestations as a resource management strategy, including woodpecker conservation areas. The no-action alternative provides for dead and dying lodgepole pine stands across the project area, providing habitat affected by the mountain pine beetle in the short and long term. Affected areas that were not included in the action alternatives due to accessibility, or retained to meet Forest Plan standards, also provide for habitat in the short and long term. The purpose and need does not include the objectives or actions suggested by the commenter; for these reasons, the suggested alternative was not analyzed in detail.

Comparison of Alternatives

Table 20. Comparison of alternatives showing how well project purpose and need is achieved and predicted preliminary effects on issues and resource concerns

Comparison Values	Alternative 1-No Action	Alternative 2 Proposed Action	Alternative 3
Purpose and Need			
1A: Manage lands suitable for timber production for the growth and yield of sawtimber, crop trees, pulpwood, and other forest products, including salvage harvest. ***1B: Forest products would be used to provide economic benefits where project objectives, forest plan objectives, and forest plan standards can be met.***			
Acres of lodgepole pine regenerated	0 acres	1,163 acres	1,022 acres
Lodgepole pine volume (salvage by clearcut harvest)	0	Sawtimber: 9,304 MBF (18,608 CCF) Non-sawtimber 2,326 MBF (4,652 CCF)	Sawtimber: 8,176 MBF (16,352 CCF) Non-sawtimber 2,044 MBF (4,088 CCF)
Acres of Douglas –fir /ponderosa pine stands commercial thinned to 40-60 basal area	0 acres	1,149 acres (including 121 acres old-growth)	666 acres (0 acres old-growth
Commercial thin volume	0	Sawtimber: 5,502 MBF (11,004 CCF) Non-sawtimber 1,376 MBF (2,751 CCF)	Sawtimber: 3,275 MBF (6,549 CCF) Non-sawtimber 819 MBF (1,637 CCF)
Acres of Douglas-fir/ponderosa pine seed tree harvest	0 acres	353 acres	353 acres
Seed tree volume	0	Sawtimber: 1,236 MBF (2,471 CCF) Non-sawtimber 309 MBF (618 CCF)	Sawtimber: 1,236 MBF (2,471 CCF) Non-sawtimber 309 MBF (618 CCF)
2A: Bring 10% of lands suitable for timber production into a managed condition			
Acres of mid- to high-elevation lodgepole pine stands treated with prescribed burning.	0	1,259	1,259
Acres of low-elevation Douglas-fir and ponderosa pine stands treated with prescribed burning.	0	731	731
Total	0	1,990	1,190
2B: Manage those stands already in a managed condition to maintain long term sustained yield.			

Comparison Values	Alternative 1-No Action	Alternative 2 Proposed Action	Alternative 3
Acres of precommercial thinning	0 acres	1,048 acres	1,048 acres
Issues			
Miles of Road Construction			
Specified Road	0 miles	1.3 miles	0 miles
Temporary road, new construction	0 miles	7.2 miles	0 miles
Acres of old-growth thinned	0 acres	121 acres	0 acres
Predicted Project Effects			
Threatened or Endangered Plant Species	No effect	No effect	
Sensitive Plant Species			
Wavy moonwort Peculiar and western moonwort Whitebark pine	No impact	May impact individuals or habitat, but would not likely contribute to a trend towards federal listing or loss of viability to the population or species	
Threatened or Endangered Wildlife Species			
Grizzly bear	No effect	No determination at this time; consulting will be conducted with USFWS	
Sensitive Wildlife Species			
Black-backed woodpecker, Bighorn sheep Fisher Gray wolf North American wolverine Townsend's big-eared bat	No impact	May impact individuals or habitat but would not likely result in a trend toward federal listing or reduced viability of the population or species	
Flammulated owl	May impact individuals or habitat but would not likely result in a trend toward federal listing or reduced viability of the population or species		
Threatened or Endangered Aquatic Species			
Bull trout	No effect	No effect	
Sensitive Aquatic Species			
Westslope cutthroat trout	No impact	May impact individuals or habitat, but would not likely contribute to a trend towards federal listing or loss of viability to the population or species.	
Western toad	No impact	May impact individuals or habitat, but would not likely contribute to a trend towards federal listing or loss of viability to the population or species.	
Invasive Plant Species			
Invasive Plants	Risk of continued spread: low	Risk of continued spread: low risk of increasing density and spread into uninfested lands; and moderate risk of spreading and establishing into areas of concern, including haul routes.	
Soils			
Projected range of detrimental disturbance for harvest units	0 – 8.7 percent	10.0 – 15.0 percent following restoration	10.0-15.0 percent following restoration

Comparison Values	Alternative 1-No Action	Alternative 2 Proposed Action	Alternative 3
and temporary roads (percentage of field plots classified as detrimentally disturbed)		(subsoiling)	(subsoiling)
Stream Sediment Delivery			
Road-stream crossings based on WEPP modeling (average pounds (lb.)/year)	2,761 lb./ year	2,145 lb./yr. during project implementation 1,459 lb./yr. post project implementation	Sediment delivery would be less than alternative 2, because new road segments would not be constructed and there would be less log haul. The greatest input of sediment from roads generally occurs during construction and active log haul during timber harvest.
Air Quality			
Air quality	No effects	Short-term impacts in project vicinity; in full compliance with MDEQ air program with coordination through the Montana/Idaho Airshed Group.	
Scenic Resources			
Scenic integrity	The high mortality of lodgepole pine would increase and have negative effects on the scenic resources. In the immediate foreground and foreground viewing distances, the amount of dead trees can often dominate the viewshed and landscape character, negatively affecting the scenic integrity.	No treatments would be seen from Concern Level 1 (CL1) platforms —Phillipsburg, Drummond, Maxville, Garrison, Grant Kohr's Ranch, Deer Lodge, Pintler Scenic Loop and I-90—areas with a High SIO management objective. Several treatment units would be visible from the Concern Level 2 platforms (NFSRs) within the project area—areas with a Moderate SIO objective. Scenic Integrity Objectives would be met at some point in the future, consist with Forest Plan scenic resource standards.	
Cultural and Heritage Resources			
Cultural and heritage resources	No effects	No effects	
Estimated Present Net Value			
Timber harvest and required design criteria	$0	$912,114	$584,513
All Activities	$0	($162,131)	($427,481)

Chapter 3. Affected Environment and Environmental Consequences

Introduction

This chapter describes the physical, biological, social and economic environments of the project area and the environmental consequences that would occur from implementing the alternatives. Together, these descriptions form the scientific and analytical basis for the comparison of effects in chapter 2. Additional details regarding area conditions, analysis assumptions, or methodology can be found in the individual resource reports located in the project file.

Consistency with Forest Plan Standards

See table C-1in volume 2, appendix C for a listing of all relevant Forest Plan standards and a discussion of the applicability and consistency of these standards to the Flint Foothills action alternatives.

Spatial and Temporal Context for Effects Analysis

The relative boundaries, and past, present and planned activities included in the effects analysis vary by resource both in area and time. This spatial and temporal context is described in each resource section. The cumulative effects analysis for each environmental component or resource area is guided by and consistent with FSH 1909.15, Section 15.2 “Bounding Effects”.

Cumulative Effects

According to the Council on Environmental Quality (CEQ), NEPA regulations, “cumulative impact” is “…the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such actions” (40 CFR1508.7). Since past actions are already included in the affected environment, the cumulative effects analysis builds upon this existing condition assessment by considering the incremental addition of direct and indirect effects of the proposed action as well as ongoing and reasonably foreseeable actions[22].

Past Actions

The environmental analysis required under the National Environmental Policy Act is forward-looking in that it focuses on the potential impacts of the proposed action that an agency is considering. Thus, review of past actions is required to the extent that this review informs agency decisionmaking regarding the proposed action (36 CFR 220.4(f)). The resource information provided in the Affected Environment narratives includes the effects of relevant past actions that may still be contributing effects to the resource and therefore are considered as part of the existing condition.

The baseline for cumulative effects analysis is the current condition. The Forest Service National Environmental Policy Act Regulations (36 CFR 220.4(f) (July 24, 2008) state, in part:

[22] Reasonably foreseeable future action: Those Federal or non-Federal activities not yet undertaken, for which there are existing decisions, funding, or identified proposals. Identified proposals for the Forest Service are described in 36 CFR§ 220.4(a)(1) (36 CFR §220.3 definitions).

> "CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effect of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives will add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present and reasonable foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simple because information about past actions may be available or obtained with reasonable effort, does not mean that it is relevant and necessary to inform decision making" (40 CFR 1508.7)

Past Vegetation and Prescribed Burning Activities

Past vegetation and prescribed burning actions considered in the affected environment and cumulative effects analysis are summarized in this section. These past activities, together with natural processes, have contributed to creating the existing condition described in this chapter. The past actions summary is not necessarily exhaustive, as records may not exist for all past activities by project. This is particularly true for those actions that predate the passage of the National Environmental Policy Act in 1970. Additional details and an associated map are provided in appendix D.

Timber was harvested in the Flint Foothills Project area to support mining, homesteading and settlement out in the valley. Timber harvest increased greatly from the 1960s through the mid-1980s and has declined in recent years. Harvest in the last decade has been post and pole thinning and roadside hazard tree removal.

Timber harvest activities included clearcut, seed tree, shelterwood, selection cut, commercial thinning (principally post and pole), sanitation (removing mistletoe infected trees) and special harvest (principally hazard tree removal). Commercial timber harvest has occurred on about 23 percent of the project area or10,265 acres (table 21).

Timber Management

Table 21 that follows displays the acres of commercial timber harvest by decade starting with 1960 and up to 2010.

Table 21. Acres of commercial timber harvest from years 1960 to 2010

Activity	1960-1969	1970-1979	1980-1989	1990-1999	2000-2010	Total acres
Stand clearcut	582	2961	125	243	0	**3,911**
Seed tree cut	51	181	88	186	0	**506**
Shelterwood cut	176	883	246	251	111	**1,667**
Selection cut	216	189	642	0	0	**1,047**
Sanitation (salvage)	0	73	331	120	0	**524**

Activity	1960-1969	1970-1979	1980-1989	1990-1999	2000-2010	Total acres
Special cut	0	74	69	129	281	**553**
Commercial thin	0	70	1,154	621	211	**2,056**
Total Acres by Decade	**1,025**	**4,432**	**2,655**	**1,550**	**603**	**10,265**

Precommercial thinning has occurred in old regeneration harvest areas, including past clearcut, seed tree and shelterwood units on about 3 percent of the project area or 1,279 acres (table 22).

Table 22. Acres of precommercial tree thinning from the years pre-1980 to 2010

Activity	Pre-1980	1980-1989	1990-1999	2000-2010	Grand Total
Total acres precommercial thinning	0	299	699	281	**1,279**

Prescribed Burning

The majority of Forest Service prescribed fire use has been disposal of logging slash, either through pile burning or jackpot burning activities. Some prescribed fire use has been for improving stand conditions for certain vegetation species (e.g. removing conifer succession in grassland-shrubland areas). Understory burns are considered low-intensity fires over the majority of the unit, whereas broadcast burning are higher-intensity fires over the majority of the unit. Minor amounts of fire woodcutter piles have also been burned. Prescribed burning has occurred on about 11 percent of the project area or 4,974 acres (table 23).

Table 23. Acres of prescribed burning from 1960 to 2010

Activity	1960-1969	1970-1979	1980-1989	1990-1999	2000-2010	Total Acres
Broadcast burning	15	132	2	79	462	**690**
Pile burning*	**27	**338	**224	***310	***203	**1,102**
Underburning	0	0	0	1,653	1,517	**3,170**
Wildlife habitat prescribed fire	0	0	0	12	0	**12**
Total Acres by decade	**42**	**470**	**226**	**2,054**	**2,182**	**4,974**

*Database records display each pile burned; above acreages are piles converted to acres using:
** 1 acre=0.10 acre dozer pile
***1 acre=0.25 acre landing pile

Present and Reasonably Foreseeable Future Actions

Table 24 displays the present and reasonably foreseeable future actions that have been identified as occurring or will occur within the project area. Each resource section identified actions from this table that are specific to that resource, and considered for the cumulative effects analysis. The activities in table 24 are displayed in figure D-2 in Volume 2, appendix D.

Table 24. Present and reasonably foreseeable future actions

Present and Reasonably Foreseeable Future Actions	
Public activities	Recreational activities such as hiking, biking, horseback riding, OHV riding, hunting, forest product gathering, camping (dispersed), snowmobiling, cross country skiing, wildlife viewing, driving for pleasure.
Activities requiring fees and or permits	(1) Douglas Cabin, recreation rental; (2) Outfitter guide services: Two Outfitters, area of operation in both Flint Foothills and Flint Uplands management areas. Activity occurs in summer and for fall big-game hunting; and (3) personal firewood and post and pole permits.
Trail maintenance	8.65 miles of trail maintenance in the project area on three trails: 8052(3.39 miles), 8054(3.89 miles), and 8049 (1.37)
Travel analysis (MVUM - motor vehicle use mapping)	The Forest has begun preliminary work on site-specific travel analyses as part of the travel planning and motor vehicle route and area designation process. The Travel Management Rule (which modified travel management regulations in 36 CFR Part 212) was published in the Federal Register on November 9, 2005. This rule requires each national forest to designate those roads, trails, and areas that are open to motor vehicle use. Following site-specific analysis, these designations will be made by class of vehicle and, if appropriate, by time of year. The travel analyses—MVUM— will be guided by the above Rule, as well as the Forest Plan, Forest Service directives, and other applicable laws, regulations, and policies. Effects from this action could change the overall mileage of roads and trail available to motorized vehicles within the project area and across the Forest. The analysis is anticipated to occur in 2014, and a Motor Vehicle Use Map (MVUM) published in 2015.
Annual road maintenance	Typical activities include surface blading, drainage cleaning and repair, roadside brushing, and sign maintenance. The annual miles of road maintenance varies; in 2011, approximately 43 miles of road maintenance was completed.
Grazing	Livestock grazing as currently permitted is expected to continue in the project area. (Five allotments, with seasons of use between 6/16 and 10/7)
Invasive plant species control	Spraying to control weeds is expected to continue in the project area. Existing invasive plant infestations within the project area are currently being treated with herbicides annually. Additional biological agents will be introduced. In 2010, the United States Forest Service Rocky Mountain Research Station released *Mecinus janthinus*, a stem mining weevil to control yellow toadflax. The Research Station will study the effects of this agent on yellow toadflax in this area and climate.
Roadside # 4 salvage hazard tree removal	Roadside tree hazard removal on 146 acres along 7.3 miles of road
Danger tree removal at developed sites	Danger tree removal within the project is being conducted in accordance with the Decision Memo for Forest-Wide Developed Site Hazard Tree Removal within the BDNF. This Decision Memo provides that dead, dying, and structurally unsound trees be removed from within developed recreation sites across the BDNF.
Winter storm damage repairs to roads. Specific descriptions provided below:	Flood damage repairs to locations on NFS roads 707 (2 sites), and 8402 are anticipated in the next 3 years. These locations experienced roadway embankment failures due to high precipitation and runoff during the spring of 2011. Funding currently being pursued for these locations include the Emergency Relief of Federally Owned Roads (ERFO) program administered through the Federal Highway Administration (FHWA).
NFS road 707 repair/ Upper Douglas	Washout repair estimated at $114,443. Regional geotechnical engineers working on design.

Present and Reasonably Foreseeable Future Actions	
Summer 2013	A spring 2011 rain on snow produced excessive flows that deposited material at the pipe inlet causing water to overflow the stream banks. The stream is running down the road for 600 feet creating a new stream channel up to 6 feet deep and up to 20 feet wide. The water has undercut the cut slope creating a small slump. This is a fish key watershed (Bull Trout and Westslope cutthroat). Repairs will include removing, cleaning and installing two pipes, excavating to the bottom of the cut created by the stream, then rebuilding the road profile with fill from a borrow source off the project. Rolling drain dips will be constructed at key points to protect the watershed and preserve the road. All unsuitable excavation will be disposed of at a site off the project. Upon reconstructing the road and replacing the culverts, the water will be directed back into the original stream channel.
NFS road 707 repair/ Lower Douglas Fall 2012	Repairs estimated at $92,914. Regional geotechnical engineers working on design. A spring 2011 rain on snow produced excessive flows that deposited debris in the stream channel, which redirected stream flow against the road fill (northern stream bank). The result is the erosion of the road fill for 200 feet. The water undermined the road shoulder creating an unstable road profile. This is a fish key watershed (Bull Trout and Western cutthroat). Road profile will be excavated to a suitable base then rebuilt using common road building practices. Large rip-rap will be placed at the stream elevation to help support the road and armor the fill slope (stream bank). Above the large rip-rap successively smaller rip-rap will be placed as the road profile/stream bank increases in elevation.
NFS road 8402 repair/ Gird Creek Fall 2012	Slump repair estimated at $78,201.50. Regional geotechnical engineers working on design. A spring 2011 rain on snow saturated the soil causing the hill to slide. The hill above the road slid onto the road and the road fill slope failed. Slope stabilization products will be keyed into the existing stable slope. Then suitable backfill will be used to rebuild the road profile. All unsuitable excavation will be disposed of at a site off the project.
Douglas Creek culvert replacements (road #s 707 and 1544)	Project replaces six culverts and re-aligns about 400 feet of stream channel, with either bridges or larger culverts, on the North Fork Douglas Creek. The Douglas Creek project is located on Forest System roads 707 and 1544 on the North Fork Douglas Creek in T9N, R12W, sections 28 and 32.
Wildland fire suppression	Wildland fire suppression actions would most likely continue in lower elevations due to proximity to private land and communities; upper elevations are available for managing wildland fires after adequate analysis determines the fire could be contained on the Forest. Time of year, fire danger, drought, weather, values at risk, firefighter and public safety are all analyzed when making this management decision
Timber harvest on private in-holdings within the project area boundary	Private land total 7,512 acres within the project area. Currently, harvest on private inholdings has occurred on approximately 80 percent (about 5,500 acres) of the forested portions. Most of the harvest on private land took place in the 1980s. Not all of the inholdings are forested; about 10 percent are nonforested, dry, grassland areas.
Emery 21 Timber Sale (Clark Fork River-Gold	Emery 21 commercial thinning (7 acres) Emery 21 Fuel Piling (hand or machine) (2 acres)

Present and Reasonably Foreseeable Future Actions	
Creek WA) On project boundary	
Forest Rose Mine and Mill CERCLA Project	This is a joint project between the Montana DEQ Mine Waste Cleanup Bureau (MDEQ - MWCB) and the Forest Service. Most of the waste (83%) is located on patented mining claims not located on National Forest System lands. This is a waste-removal project that will take place in the Dunkleberg Creek area, The project is scheduled for implementation in July 2012 and is anticipated to be finished no later than August 2013.NFS road 707 will be reconstructed and used for access to this project, from Interstate 90 (Jens exit). Repairs to the Upper Douglas Creek washout (see “NFS road 707 repair/ Upper Douglas” activity above) may be included. A site investigation will occur once snow melts on the road in Spring 2012.
Placer mining exploration	Two approved plans of operation for exploration (test holes) in a highly disturbed historic mining area T 8W, R 12 N, Section 11
Montana State Prison lands (Outside of project area)	Future timber harvest in Douglas-fir and lodgepole pine estimated to average 50-70 acres per year.
Montana DNRC lands (Outside of project area)	Potential future harvest on lands near Douglas Creek (section 36).
BLM lands (Outside of project area)	Flint Creek Integrated Project. Prescribed fire treatments on BLM and FS lands.
BLM lands (Outside of project area)	Ongoing livestock grazing

Vegetation

Introduction

The Flint Foothills Vegetation Management Project area is roughly 44,522 acres on the north end of the Flint Range, located on the Pintler Ranger District of the Beaverhead-Deerlodge National Forest (BDNF). Eighty-three percent of the area (Forest Service ownership 37,010 acres; private ownership, 7,512 acres) is managed by the BDNF. The analysis area for this Vegetation Report is the 44,522-acre project area.

This Vegetation section provides analysis of the existing condition of the major vegetation types within the project area and the effects of the proposed action on those major vegetation types. A discussion of dominant processes provides the characterization of change that has occurred over time to the vegetation types that provides the basis for the analysis.

Forest Plan Direction and Other Laws and Regulations

The regulatory framework and direction for the management of vegetative resources on the Beaverhead-Deerlodge National Forest includes the Forest Plan, the Forest and Rangeland Renewable Resources Planning Act Of 1974, National Forest Management Act of 1976, and Forest Service Handbook (FSH 2409.17). These are discussed in detail in the Vegetation report in the project file.

Overview of Issues Addressed

The relevant issue to this analysis is old growth. This issue will be analyzed in the effects discussion of this vegetation analysis.

Measurement Indicators

The measurement indicators used to evaluate impacts of alternatives:

- Acres of lodgepole pine regenerated
- Acres of basal area reduction, growing conditions improved with thinning of Douglas-fir/ponderosa pine stands
- Acres of basal area reduction, growing conditions improved, and type change of old growth from multi-story to single story
- Acres of Douglas-fir/ponderosa pine regenerated
- Acres of basal area reduction and growing conditions improved with low-intensity prescribed burning of low-elevation Douglas-fir and ponderosa pine stands
- Acres of lodgepole pine regenerated through prescribed burning in mid- to high-elevation lodgepole pine stands
- Acres of growing conditions in young stands improved by reducing stand density in past timber harvest areas

Affected Environment

Existing Condition

A combination of site-specific scientific information in the Flint Foothills Project area as well as results of studies completed in ecosystems and landscapes of the Western United States and Northern Rocky Mountains were used to assess the processes that influenced vegetation composition and structure in the analysis area.

Dominant Processes

Composition and configuration of vegetation in the Flint Foothills Project area prior to European settlement was shaped by natural disturbances and processes and to a lesser extent, Native American land management. Natural disturbances and processes that influenced and would continue to influence vegetation in this area include climate variability, watershed processes (i.e., flooding, mass wasting, debris flows, avalanches), fire events, and insect population dynamics. Native American land management was characterized by fire ignitions for travel corridors, forage improvement, game habitat improvement, and maintenance of native plant food sources. More recently, vegetation after European settlement has been shaped by Forest Service management practices, such as timber sale activity, domestic grazing and fire suppression.

Forest Carbon Cycling and Storage

As a major disturbance on the landscape, the mountain pine beetle epidemic

with dead trees releasing carbon to the atmosphere as they decompose. Over time, these areas may shift back into a sink stage in their carbon cycle when carbon uptake by new tree regeneration exceeds the emissions from decomposing dead organic material.

Net ecosystem productivity (NEP) is a direct measure of the degree to which an ecosystem is a source (NEP less than 0) of, or a sink (NEP greater than 0) for atmospheric carbon over the time period of interest (Brown et al. 2010). Net ecosystem productivity is negative (or decreased) when carbon lost through decomposition exceeds that gained through photosynthesis. The mountain pine beetle epidemic has affected the net ecosystem productivity in these stands in several ways. First, stand photosynthesis has been dramatically reduced with the increasing severity of attack due to the death of canopy trees. This is accompanied by a corresponding decrease in stand respiration i.e., release of carbon dioxide. The decline in photosynthesis could be reduced by increased growth of tree seedlings, saplings, trees that survive the beetle attack, shrubs, grasses, and forbs (Brown et al. 2010). A substantial increase in carbon release would be expected once dead standing trees begin to fall and decompose in the next 5-15 years; these fall rates of pine trees are predicted by Mitchell and Preisler (1998).

Mountain pine beetles kill larger lodgepole pine trees preferentially, therefore, these killed trees represent proportionally larger values of carbon stocks (or sequestration) and above-ground tree carbon production within stands; more and larger trees killed results in greater decreases in carbon sequestration. Stand-level carbon can be recovered to pre-outbreak values in 25 years or less; it takes 50-160 years to recover to carbon storage values from simulations where stands were not attacked. The size distribution of surviving trees can shorten this timeframe; a greater number of smaller trees store carbon at a greater rate through an amplified growth rate when compared to larger survivors, having a greater capacity to take advantage of increased resource availability (Pfeifer et al. 2010). Successful tree regeneration is a much more critical factor in recovering carbon than stand age class distribution or tree density. As long as post-disturbance lodgepole pine stands support enough trees to have the structural characteristics of forests rather than shrublands, grasslands, or other kinds of nonforest vegetation, they would recover pre-disturbance carbon stocks quickly and the landscape would be resistant to long-term changes in carbon storage (Ryan et al. 2008).

Pregitzer and Euskirchen (2004) synthesized results from 120 separate studies of carbon pools and carbon fluxes for boreal, temperate, and tropical biomes. They found that forest age is a highly significant source of variability in net ecosystem productivity at the biome scale. In temperate forests such as those in the project area, the mean net ecosystem productivity was negative (a carbon source), but also the most variable in young stands (0-10 years). Mean NEP is positive and is highest (a carbon sink) in stands 11-30 years old, declining thereafter as stands age, but still remaining positive.

These studies also reveal a general pattern of total carbon sequestration declining after disturbance, increasing rapidly during intermediate years, and then declining over time until another significant disturbance (timber harvest or tree mortality resulting from drought, fire, insects, disease, or other natural disturbances) kills large numbers of trees and again converts the stands to a carbon source. In this situation, carbon emissions from the decay of dead biomass exceed the amount of carbon removed from the atmosphere by photosynthesis within the stand. Over the long-term (centuries) net carbon storage is often zero if stands regenerate after disturbance because re-growth of trees recovers the carbon lost in the disturbance and in decomposition of trees killed by the disturbance (Kashian et al. 2006).

Recent scientific literature confirms some general patterns of forest carbon storage and release over the period of forest stand development and natural or induced disturbances. For large-scale context, our nation's forests have and continue to sequester vast amounts of carbon, equivalent to approximately 10 percent of annual U.S. carbon dioxide emissions from burning fossil fuels, with some estimates are as high as 19 percent (Heath and Smith 2004; Birdsey et al. 2006; Ryan et al. 2010; McKinley et al. 2011). Nationally, forests are a net carbon sink, sequestering far more carbon than they release.

Climate and Climate Change

Fluctuations in temperature and precipitation that characterized historic climate likely influenced vegetation distribution and patch size in the Flint Foothills project area by affecting other processes such as germination and establishment of native species, fire regimes, insect activity, erosion, and stream morphology. Despite the uncertainty of future climate conditions at local scales, the majority of published science suggests that climate changes may strongly influence the frequency, intensity, and size of disturbances (such as fire and extensive insect outbreaks) in coming decades on areas of the BDNF. These disturbances have important consequences for community protection, timber water yield, carbon storage, timber production, invasive species, and public perception of forest management. Changes in disturbance prompted by climate change are likely as important as incremental changes in temperature and precipitation for affecting ecosystem productivity and species composition (FP FEIS, p. 1041).

Insects

Mountain pine beetle (MPB) populations have been cyclic in conifer stands of the Flint Foothills area. This species affects three species in the project area; lodgepole pine (*Pinus contorta*), ponderosa pine (*Pinus ponderosa*) and whitebark pine (*Pinus albicaulis*). Twenty to forty-year cycles of population increases lasting up to 11 years initially kill larger individual trees before successively killing smaller individuals (Cole and Amman 1980). Up to 60 percent of trees greater than 8 inches in diameter are killed when mountain pine beetle populations are epidemic.

Currently, the Flint Foothills project area is part of a larger epidemic occurring across the majority of the Beaverhead-Deerlodge National Forest and on other forests in the Northern region. Mountain pine beetle has been active in the Flint Foothills area since about 2000, reaching epidemic proportions beginning in 2007 (based on field reconnaissance of the area) and resulting in extensive areas of dead and dying[23] lodgepole pine, and the mortality of more individually scattered ponderosa pine and whitebark pine. Mountain pine beetle infestations are a regular force of natural change in forested ecosystems; however, several current outbreaks occurring simultaneously across western North America are the largest and most severe in recorded history (Bentz 2008). As trees become older than about 50 years, the proportion of trees in a given stand able to resist the beetles generally decreases. This is especially true in even-aged stands of lodgepole pine (Randell 2000). Outbreaks in even-aged stands of older trees of the same diameter class kill almost all trees, whereas mixed-aged stands lose mostly the larger trees (Amman et al. 1977).Table 25 summarizes the annual affected acreage totals and the total number of trees estimated to have been attacked over the entire Flint Foothills area,

23 For this project, dead pine trees are defined as those having red/brown or no needles. Dying trees are defined as those trees with green needles having more than five visible pitch tubes (Klein et al. 1978) on more than one face of the bole of the tree or have visible frass (the fine, sawdust-like boring dust) (Amman and Logan 1998).

including non-Federal lands for these years. Note that acreage totals can have overlap from year-to-year, as mountain pine beetle attacks can be progressive over several years within a particular acre.

Table 25. Mountain pine beetle acres and total trees affected in the Flint Foothills project area

	2000	2002	2003	2004	2005	2006	2007	2008	2009	2010
Mountain Pine Beetle Affected Acres & Trees	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**
	no survey	1617	104	no survey	0	745	no survey	12971	19135	3421
	Total Trees	**Total Trees**	**Total Trees**	**Total Trees**	**Total Trees**	**Total Trees**	**Total Trees**	**Total Trees**	**Total Trees**	**Total Trees**
	no survey	621	174	no survey	0	1802	no survey	102423	173463	65439

Note: Acreage totals from year-to-year are not cumulative: Mountain pine beetle attacks are typically the same acre; however, the total trees attacked can be viewed as what was attacked in that individual year.

Mountain pine beetle populations have been maintained and increasing year-by-year due to the recent above average winter and spring temperatures, allowing a high over-winter success. Pine stand conditions across the BDNF are conducive for carrying epidemic populations and without a change in over-winter temperatures to colder extremes, the epidemic would continue until the host species of the appropriate diameter (about 5 inches and larger) have been exhausted. Within the Flint Foothills Project area on National Forest System lands, it is estimated that all (100 percent) of the pine stands in the project area that have trees 5 inches in diameter and larger have been affected by mountain pine beetle (19,199 acres with lodgepole, ponderosa pine or whitebark pine component; figure 8 and figure 9). Western spruce budworm (*Choristoneura occidentalis*) occurrence has been most evident at lower elevations where Douglas-fir occurs. Western spruce budworm population booms last up to 30 years and cause mortality in small, and defoliation of large, Douglas-fir trees. Increasingly, dense, late-successional stands of Douglas-fir are susceptible to western spruce budworm because these stands are often stressed by competition. Areas of higher mortality due to western spruce budworm in contiguous stands of Douglas-fir can be seen in the Gird Creek to Douglas Creek areas (figure 10).

Douglas-fir bark beetle (*Dendroctonus pseudotsugae*) numbers have generally thought to be in decline in the Northern Region as well as the Flint Foothills project area; however, an increase in individual numbers of Douglas-fir trees killed by Douglas-fir bark beetle have been noted in the Dunkleberg Ridge, Jackson Park and Blum Creek areas. An increase of mortality due to Douglas-fir bark beetle can be attributed to the heavy and repeated defoliation from western spruce budworm which may lead to increases in Douglas-fir beetle activity. Additionally, highly dense stand conditions are also contributing to the increase in mortality to Douglas-fir from Douglas-fir bark beetle activity (figure 11). Figure 12 that follows is a map displaying the USDA Forest Service Aerial Disease Survey (ADS) data showing the progression of the mountain pine beetle and Douglas-fir bark beetle infestation from 2000 through 2010.

Figure 8. A mix of dead and live lodgepole pine –Unit 26S.

Figure 9. Dead ponderosa pine killed by mountain pine beetle in the Dunkleberg Creek area.

Figure 10. Spruce budworm defoliated Douglas-fir in Dunkleberg Creek area.

Figure 11. Large Douglas-fir killed by Douglas-fir bark beetle in Dunkleberg Creek area.

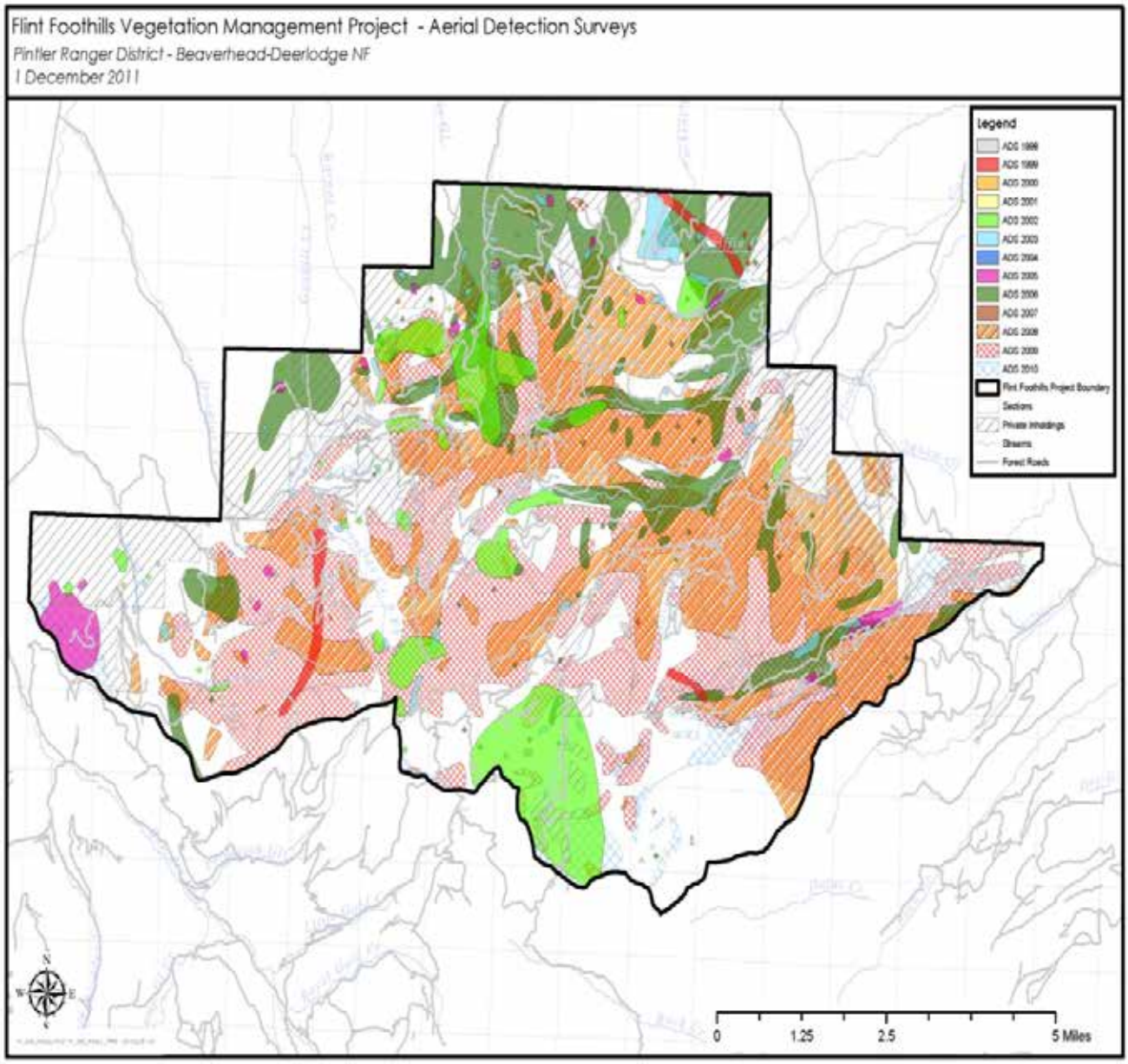


Figure 12. Mountain pine beetle and Douglas-fir bark beetle progression

USDA Forest Service Aerial Disease Survey data

Rusts, Fungi, and Microbes

The bulk of rust, fungi and microbes occurring in the Flint Foothills area are important components of ecosystem function and structure. Alternatively, white pine blister rust (*Cronartium ribicola*) is a nonnative species that has negatively affected five-needle pines in the western United States during a portion of its life cycle (McDonald and Hoff 2001). Limber and whitebark pines are the only five-needle pines on the BDNF; whitebark pine is the most common on the forest. Limber pine does not occur in the project area; whitebark pine comprises about 1.5 percent of the Flint Foothills area. In portions of the BDNF white pine blister rust has resulted in widespread mortality of whitebark pine; although a comprehensive field review of higher elevations within the Flint Foothills area has not been done, the stands

that have been reviewed show whitebark pine overstory trees moderately to severely impacted by a combination of blister rust and mountain pine beetles.

Fire

Fire was historically the predominant natural disturbance in the Flint Foothills Project area and lightning ignitions largely determined where and when fires started (Agee 1993, Baker 2002, Pyne 1982); while indigenous burning is presumed to have occurred at lower elevations within the analysis area (Kimmer and Lake 2001). Fire regimes are differentiated by the frequency, extent, severity, and timing of fire events associated with vegetation. The presence or absence of fire does play a key role in the composition and structure of vegetation that occurs in the project area (figure 13). The frequency and severity of past fires can, to a certain extent, be determined by looking at the existing condition of the different vegetation types in the project area. Although variable, natural fire intervals are a reflection of the vegetation types that occur in broad elevation, aspect and slope bands across the project area.

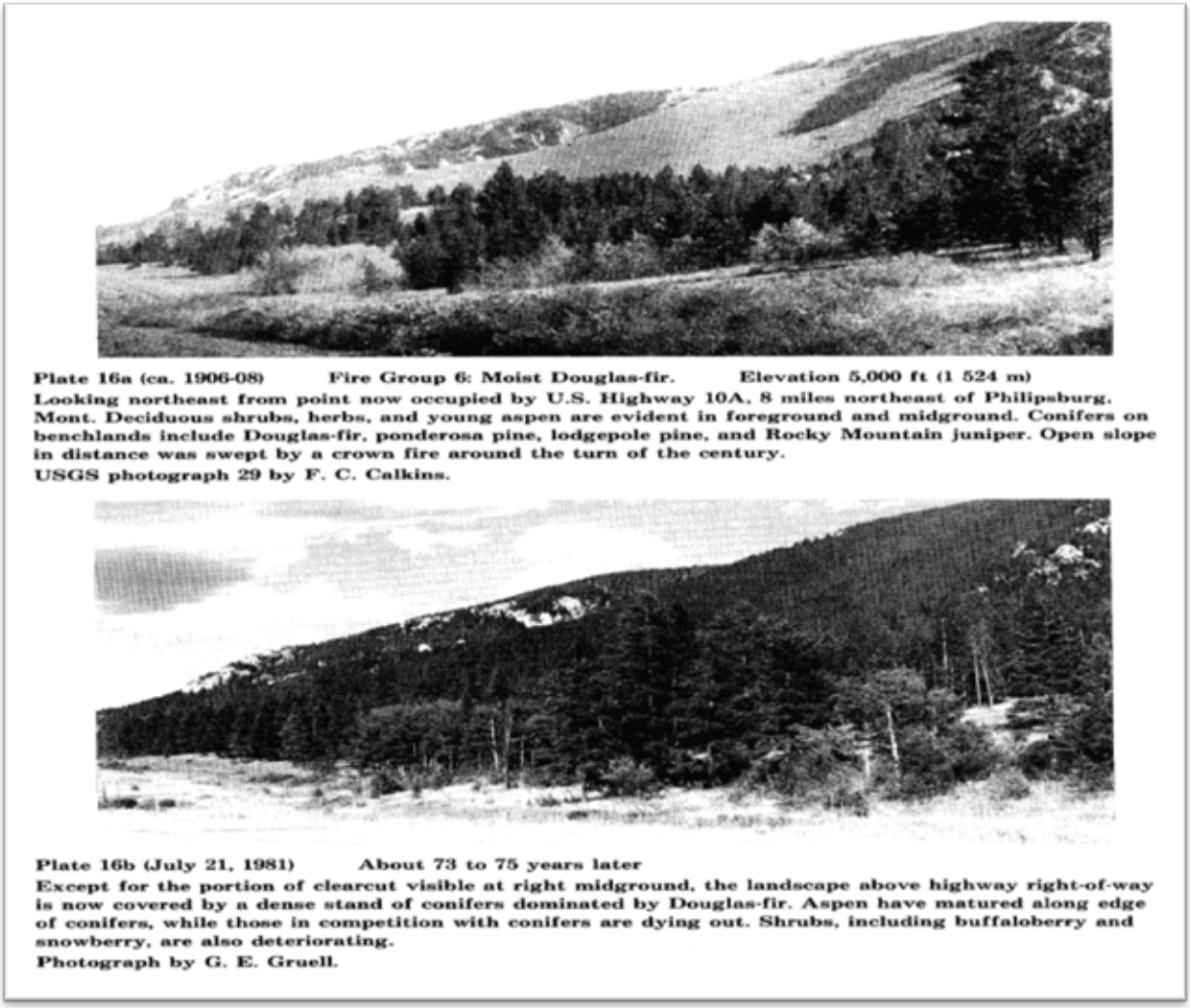


Figure 13. Effects of the absence of fire over about 75 years in the Flint Creek drainage

Upper photo from circa 1906-08, lower photo from 1981 (Gruell 1983)

High frequency, low severity fire regimes were historically typical of low elevation dry forests of Douglas-fir and mixed Douglas-fir/ponderosa pine on the BDNF. Senesced grass and herb communities fueled understory fires in these forests, allowing dominant conifer species to survive multiple low intensity fire events that killed seedlings and created low density stands (Heyerdahl et al. 2006). For the moist Douglas-fir type fire was an important agent in controlling density and species composition. Frequent low or moderate severity fires favored ponderosa pine over Douglas-fir in stands where it occurred (Fischer and Bradley 1987). In the analysis area, fire scars indicate a natural mean fire interval of 20 years in the low elevation forests until the early 1900s (USDA Forest Service 1994). The fire interval was disrupted at that time due to a combination of events: indigenous burning ended as the area was populated by European Americans; and intense grazing to support new settlements reduced available grass as a light-fuel. Additionally, fire suppression was initiated with the formation of the National Forest System.

Mixed severity fire regimes historically occurred in several forest types in the region such as early seral subalpine fir forest types dominated by lodgepole pine (Arno 1980, Arno et al. 2000). A mixed severity fire is a mixture of ‘stand-replacement’ (where most of the conifers die) and ‘understory’ (where most of the conifers live) variable intensity fire. Fuel loads increased in the mid- to high-elevation forests with the less frequent fires than those of lower elevation forests. Mixed severity fire regimes are when fire spread in mid- to high-elevation forests exhibit fire behavior that would include low severity surface fire, single or clustered tree torching, and high severity crown fire; all within a single fire perimeter. Fire intervals that produce the mixed severity fire regimes in the project area are highly variable, and are influenced by proximity to lower elevation areas of high frequency fires, climate, and fuel loading. Multiple fire scars on lodgepole trees observed in the project area suggest some lower intensity thinning fires occurred along with higher intensity stand replacement fires.

Fire frequency determines vegetation successional stage and fuel conditions and past fire shape and size play a role in fuel connectivity and landscape heterogeneity or homogeneity (Arno et al. 2000, Turner et al. 1998). Summer persistent snow pack in high elevation forests historically resulted in high fuel moisture and low potential for fire spread on an annual basis; extended time between fires then cause a buildup of high fuel loading so that when a fire does become established, fire is more readily able to spread from surface to crown with potential for canopy consumption in these forests (Romme 1982). These trends in fire and the relationship between fire and climate in the northern Rocky Mountains existed in the distant (Heyerdahl et al. 2008) and recent past (Morgan et al. 2008). The last major fires to occur in the project area were in 1847 and 1867; the entire extent of these two large fires are not known, but multiple areas from 400 to 800 acres of contiguous fuel arrangement are attributed to them, even though the fires had burned many more total acres when they occurred (USDA Forest Service1994).

The majority of Forest Service prescribed fire use has been to dispose of logging slash, either through pile burning or jackpot burning activities. Some prescribed fire use has been for improving stand conditions for certain vegetation species (e.g., removing conifer succession in grassland/brushfield areas). Understory burns are considered low intensity fires over the majority of the unit, whereas broadcast burns are higher intensity fires over the majority of the unit. Prescribed fire has occurred on about 11 percent of the project area or 4,974 acres (table 26).

Table 26. Total acres of prescribed fire by years in the Flint Foothills Project area

Activity	1960-1969	1970-1979	1980-1989	1990-1999	2000-2010	Total Acres
Broadcast burning	15	132	2	79	462	690
Pile burning*	**27	**338	**224	***310	***203	1,102
Underburning	0	0	0	1,653	1,517	3,170
Wildlife habitat prescribed fire	0	0	0	12	0	12
Total	**42**	**470**	**226**	**2,054**	**2,182**	**4,974**

** 1 acre=0.10-acre dozer pile
***1 acre=0.25-acre landing pile

Although a combination of disturbance factors contribute to size-class distribution in forest types, the dominant disturbance factor determining size is fire when an active component, or the lack of fire with fire suppression management strategies. A distribution of size classes by dominance group follows in table 27. The absence of fire, due in part to the past century of management strategies on Federal lands, has resulted in a skewing towards larger size classes. Early seral conditions have only been created through timber harvest practices.

Table 27. Size class distribution by dominance group

Dominance Group	Size Class				
	Early Seral (Seedling)	Mid Seral (Pole)	Mid to Late Seral (Sawtimber)	Late Seral (15+ inch)	Total
Subalpine fir with other shade tolerant conifers	38	4	25	-	66
Whitebark pine	8	50	110	-	167
Whitebark pine with lodgepole pine	7	161	337	-	505
Lodgepole pine	1,181	8,851	8,098	1	18,131
Lodgepole pine with whitebark pine	-	-	11	-	11
Engelmann spruce with other shade tolerant conifers	5	-	548	11	565
Ponderosa pine	37	125	-	-	162
Ponderosa pine with lodgepole pine	8	75	13	8	104
Quaking aspen	-	-	-	-	178
Douglas-fir	707	2568	14,085	82	17,442
Douglas-fir with ponderosa pine and/or lodgepole pine	22	18	66	14	119
Total	**2,011**	**11,852**	**23,294**	**116**	**44,522**

Old Growth

Old-growth stands as defined by Green et al (1992, errata corrected 2007, 2008) do occur in the Flint Foothills Project area. Stand exam surveys were completed during field season 2010 in a small portion of the project area. Stand exams were conducted in Douglas-fir/ponderosa pine (781 acres) and lodgepole pine (529 acres) stands. Old growth was identified in Douglas-fir/ponderosa pine stands (see table 28 and figure 14, figure 15 and figure 16 that follow). In addition to stand exams, informal surveys in each proposed unit were completed by a silviculturist. Informal surveys included measuring basal area and aging trees to ascertain stand characteristics. Although these surveys noted a few individual, scattered, old trees in additional stands that did not have formal stand exam surveys, the occurrence of these trees were at numbers far below old-growth standards; these old trees exist as a component in the mid- to late-seral size classes. Old-growth forests are distinguished by old trees and structural characteristics developed over time (ibid). An analysis of old growth over large landscapes as part of Forest Plan revision using FIA data was completed (Bush et al 2006). In the Clark Fork/Flints landscape, Bush et al (2006) estimate that 20.9 percent of the Forest is in old growth with a 90 percent confidence interval of 14.1 – 28.1 percent. This old-growth analysis indicates that old growth in the Clark Fork/Flints landscape is not deficient at the regional scale (ibid). Old growth was not mapped specific to Flint Foothill Project area beyond the formal stand exam surveys and informal surveys that were conducted in each proposed unit.

Table 28. Acres of inventoried old growth

Inventoried old growth stands	Acres
81104008	14
81104009	17
81104038	28
85202013	11
85202025	33
85202029	15
85301060	163
Total acres of Inventoried Old Growth	**281***

Total acres do not reflect total old growth in the project area

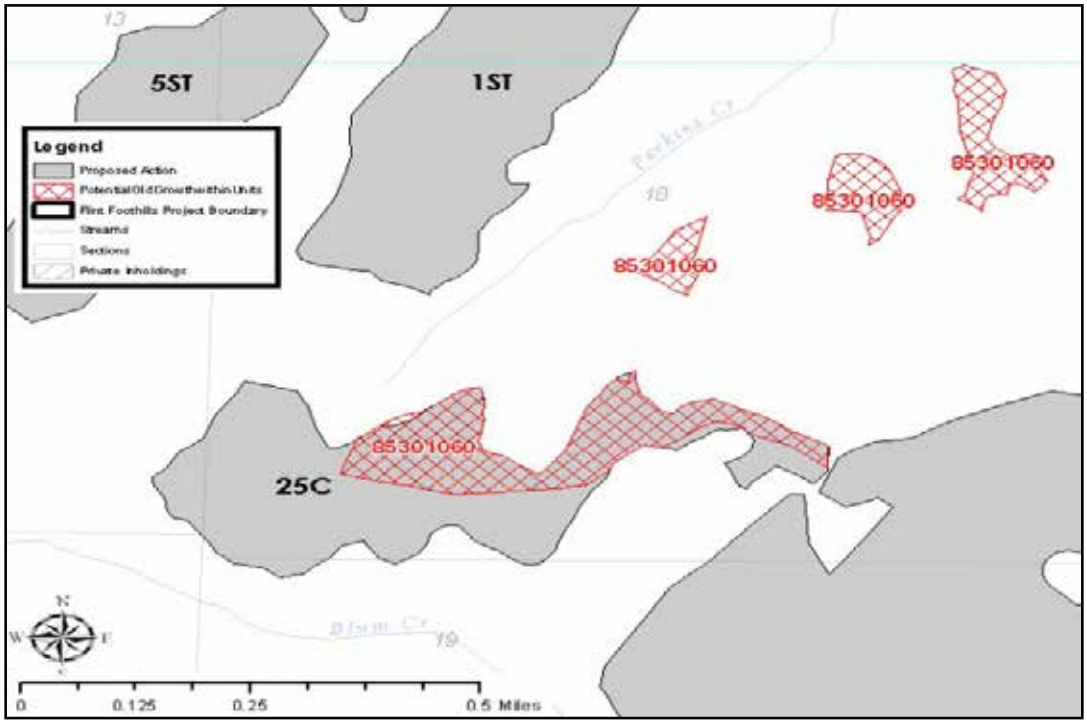


Figure 14. Old growth areas in Perkins Gulch

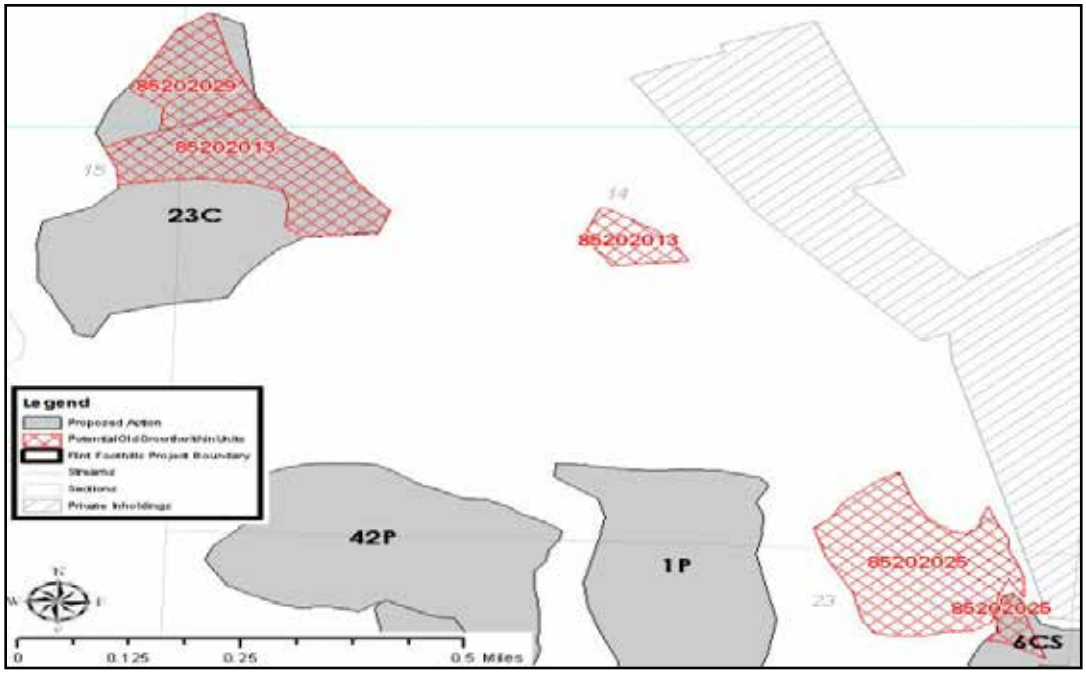


Figure 15. Old growth areas in Perkins Gulch

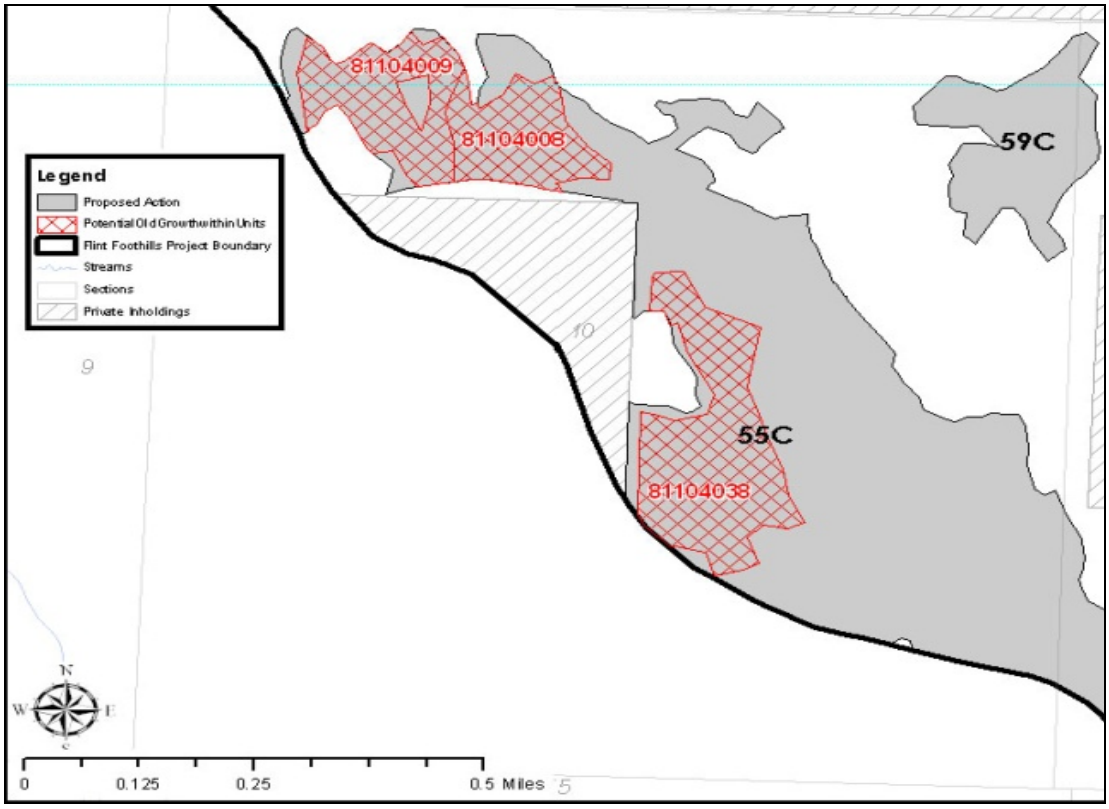


Figure 16. Old growth areas in Gird Creek

Timber Management

Timber was harvested in the Flint Foothills Project area to support mining, homesteading and settlement out in the valley. Timber harvest increased greatly from the 1960s through the mid-1980s but has declined in recent years. Harvest in the last decade has been post and pole thinning and roadside hazard tree removal.

Timber harvest activities included clearcut, seed tree, shelterwood, selection cut, commercial thinning (principally post and pole), sanitation (removing mistletoe infected trees) and special harvest (principally hazard tree removal). Commercial timber harvest has occurred on about 23 percent of the project area (10,265 acres; see table 29)

Table 29. Total acres of commercial timber harvest in the Flint Foothills Project area 1960-2010

Activity	1960-1969	1970-1979	1980-1989	1990-1999	2000-2010	Total acres
Stand clearcut	582	2961	125	243	0	3,911
Seed tree cut	51	181	88	186	0	506
Shelterwood cut	176	883	246	251	111	1,667
Selection cut	216	189	642	0	0	1,047
Sanitation (salvage)	0	73	331	120	0	524
Special cut	0	74	69	129	281	553
Commercial thinning	0	70	1,154	621	211	2,056
Total:	**1,025**	**4,432**	**2,655**	**1,550**	**603**	**10,265**

Precommercial thinning has principally occurred in old regeneration harvest areas, including past clearcut, seed tree and shelterwood units. Precommercial thinning has occurred on about 3 percent of the project area or 1,279 acres (table 30).

Table 30. Acres of precommercial thinning in the Flint Foothills project area from pre-1980-2010

Activity	Pre-1980	1980-1989	1990-1999	2000-2010	Total
Precommercial thinning	0	299	699	281	1,279

Grazing, Invasive weed treatment

Past cattle grazing in the project area has left effects of variable intensity, and may have contributed to the spread of invasive plants, such as knapweed (refer to the Noxious Weeds and Livestock Grazing analysis.) However, the majority of invasive plant introduction is from motorized routes (roads and trails). Invasive weeds have been treated and continue to be treated with herbicides; dry grassland parks are susceptible to the threat of invasive weeds, but have not been impacted due to the success of the weed spray program.

Vegetation Types

Existing Vegetation Summary

Vegetation within the Flint Foothills project area is summarized in table 31. The distribution of the vegetation cover types is displayed below in figure 12.

Table 31. Existing cover types by dominance groups

Dominance Group	Total Acres	Dominance Group	Total Acres
Dry grasslands	4,488	Lodgepole pine	18,131
Wet grasslands	100	Lodgepole pine with whitebark pine	11
Wet shrublands	178	Engelmann spruce with other shade tolerant conifers	565
Sparsely Vegetated	2,241	Ponderosa pine	162
Water	65	Ponderosa pine with lodgepole pine	104
Subalpine fir with other shade tolerant conifers	66	Quaking aspen	178
Whitebark pine	167	Douglas-fir	17,442
Whitebark pine with lodgepole pine	505	Douglas-fir with ponderosa pine and/or lodgepole pine	119
		Grand Total Acres	**44,522**

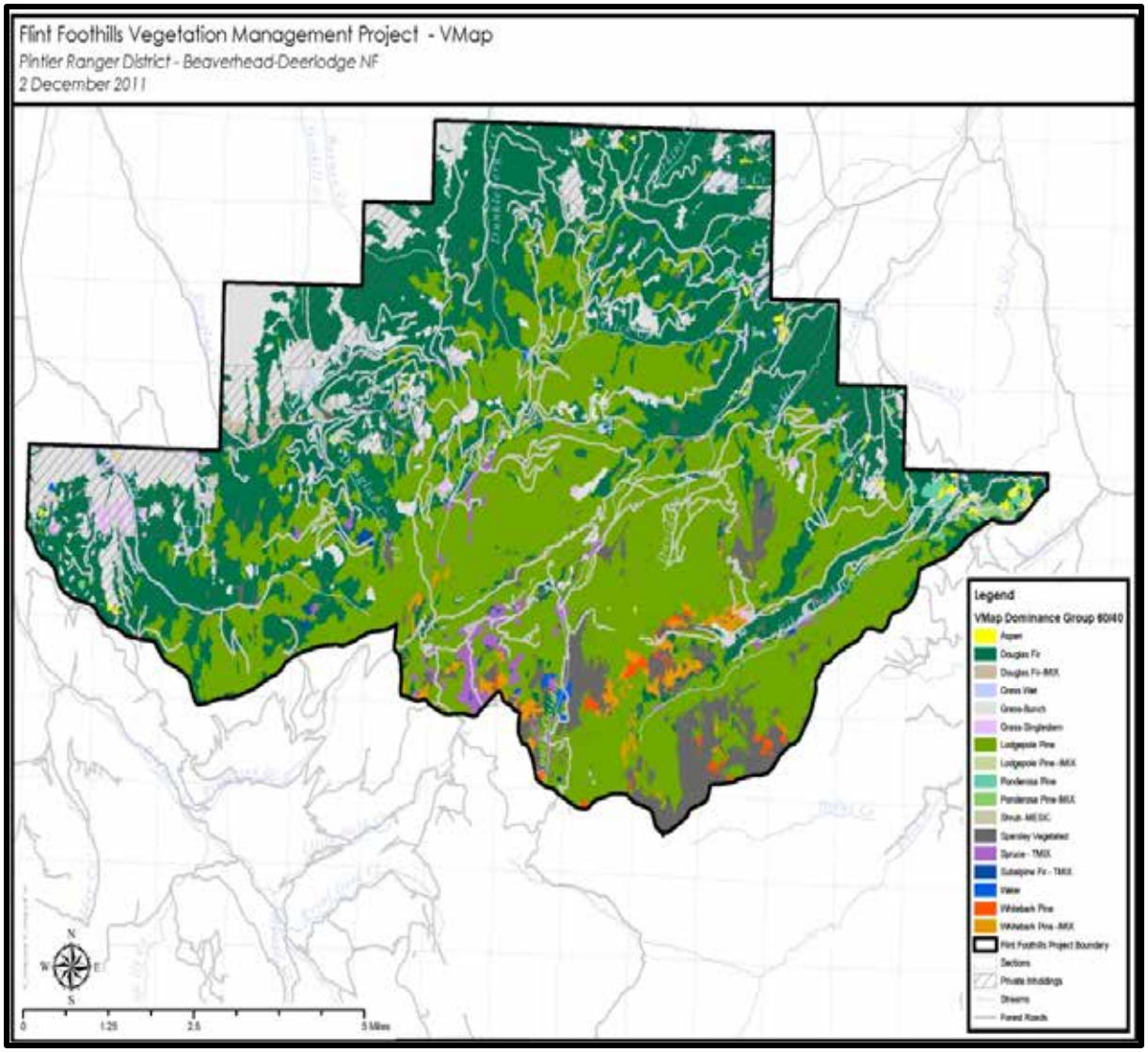


Figure 17. Distribution of cover types in the Flint Foothills Project area

Douglas-fir and ponderosa pine vegetation type

Historically, many dry coniferous forests were shaped by frequent, low-intensity fire; this included the warm, dry as well as moist Douglas-fir habitat types of the Flint Foothill Project area. This disturbance regime sustained open, large-tree dominated structures with diverse and productive understory communities (Arno 1980, Hessburg and Agee 2003). However, over the last century, fire suppression, livestock grazing, and high-grade logging, among other factors, have altered the structure and function of dry coniferous forests across much of western Montana. Forest structure and composition has been most significantly altered with the lack of fire disturbance; the disruption of the natural fire intervals of the past have resulted in higher stand densities, multi-layered stands of mostly one species, Douglas-fir. Dramatically higher stand densities and development of ladder fuels (Covington and Moore 1994a, Arno et al. 1995, Peterson et al 2005) increase the risk of uncharacteristically severe wildfire (Everett et al 2000, Friederici 2003), bark beetle infestations (Fettig et al. 2007), and in some areas such as the Flint Foothill project area, successional replacement by shade-tolerant competitors (Gruell et al. 1982, Fischer and Bradley 1987, Mutch et al. 1993, Habeck 1994, MacKenzie et al. 2004).

Along with dry grassland parks, Douglas-fir with very little ponderosa pine dominates the low to middle elevations of the Flint Foothills Project area (17,827 acres or 40 percent of the project area; see table 31). In contrast to early 1900s conditions of open-grown, larger diameter stands of Douglas-fir and ponderosa pine, current Douglas-fir stands in the project area are continuous, mid- successional and densely stocked, and establishing into dry grassland and quaking aspen communities. The increase in extent and continuity of this coniferous vegetation type has effectively reduced landscape vegetation heterogeneity and associated biodiversity and put unique habitat types of the Flint Foothills Project area (most importantly aspen and seral ponderosa pine communities) at risk of irreversible habitat conversion. Highly dense stands of Douglas-fir have been affected by western spruce budworm and an increase of individual trees killed by Douglas-fir bark beetle has been noted in the project area through field surveys. Additionally, mortality of very large ponderosa pine through bark beetles has been noted in the project area through stand exams.

Lodgepole pine vegetation type

Even-aged stands of lodgepole pine currently impacted by the mountain pine beetle epidemic make up about 41 percent of the Flint Foothill Project area; virtually all (about 100 percent) of the 18,142 acres of the lodgepole pine type greater than 5 inches in diameter has been affected by mountain pine beetle. Stand exam surveys in the project area have found tree ages of all species range from 80-120 years. Under forested canopies, intermediate and understory trees are rare (mostly suppressed lodgepole pine and Douglas-fir seedlings and saplings) and average 60-82 years old.

Cool habitats dominated by lodgepole pine are common in the Flint Foothills Project area. Two habitat types represented the broader cool habitat types dominated by lodgepole pine: habitats where lodgepole pine was the climax species and occurred as pure stands prior to climax; and mixed conifer habitats where lodgepole pine was dominant in most stands. Fire disturbances historically characterized the mosaic of age classes and stand successional stages of cool habitats dominated by lodgepole pine that characterized mid to upper elevations in the Flint Foothills area. Currently, over 17,000 acres out of the 18,142 acres of the lodgepole pine vegetation type are mid- to late seral, indicating a very homogeneous landscape in the project area. Past fire disturbances suggest a more heterogeneous landscape.

Dense lodgepole pine stands dominated cool habitats, and are one of the most common vegetation types in the Flint Foothills area. Habitat types below 7,500 feet experienced more frequent fire than those above this elevation. At lower elevations fire perpetuated lodgepole pine by eliminating shade tolerant species from stands. Fischer and Clayton (1983) indicate that lodgepole pine-dominated areas occurred in patches ranging from five to hundreds of acres. Elevations above 7,500 feet fires under natural disturbance regimes were more infrequent, lightning-caused fires that burned with mixed fire severity; the result being a patch-mosaic of lodgepole pine size classes (Fisher and Bradley 1987).

Mixed conifer vegetation type

In the project area, the mid- to high elevation forest are currently large homogeneous mature stands, lacking stand age diversity that comes from past fire disturbances that characterized a more heterogeneous project area. Blister rust has accelerated succession to subalpine fir by killing mature whitebark pine, and mountain pine beetle has killed the majority of lodgepole in the project area (table 25); this coupled with the lack of fire as a recycling agent has caused a major shift in landscape composition and structure from one of pine to fir and spruce (Keane 2000). Whitebark pine is a foundation species of high elevation ecosystems, providing snow

capture and retention, carbon storage, increasing biodiversity, and serving as a good food energy source for wildlife (Tomback et al. 2001). Throughout its range, whitebark pine is experiencing rapid mortality due to several factors including the exotic white pine blister rust (*Cronartiam ribicola*), the native mountain pine beetle (*Dendroctonus ponderosae*) infestation, and wildfire exclusion resulting in conifer encroachment, (USDA Forest Service 2010; Fish and Wildlife Service 2011). Warming temperatures are thought to further increase the rate of mortality due to favorable conditions for white pine blister rust and mountain pine beetle (Greater Yellowstone Coordinating Committee whitebark Pine subcommittee, 2011).

Within the Flint Foothill project area, many of the mature whitebark trees have been killed by mountain pine beetle over the approximately 683 acres of whitebark stands or mixed conifer (lodgepole pine, subalpine fir, Engelmann spruce and Douglas-fir) with whitebark trees. There is a strong relationship between rates of whitebark pine killed by MPB and whitebark pine regeneration density that indicates that stand-scale gap-phase[24] dynamics may be one response to mountain pine beetle outbreaks (Larson and Kipfmueller 2010). Project area-specific surveys have been completed in whitebark pine. The surveys as well as Forestwide monitoring have shown a substantial amount of whitebark regeneration established under more pure whitebark pine stands, and mature whitebark pine trees persisting in the face of both beetle and blister rust pressure (USDA Forest Service 2011). This establishment of whitebark pine seedlings underneath dead whitebark mature trees has been observed in the project area. Whitebark pine occurs most commonly at the highest elevations in the project area, with a few scattered individuals or in smaller (0.25- acre) patches down to the mid-elevations.

Ongoing successional replacement of whitebark pine with the absence of fire may actually be enhanced by blister rust and mountain pine beetle kill; this is especially true where fire exclusion reduces the opportunity for whitebark regeneration (FP FEIS, p. 453). Morgan et al. (1994) found that other conifers replace whitebark pine, in the absence of fire.

Arno (1989) reported wildfire is an important process for whitebark pine with fire return intervals from 50 to 300 years in the Northern Rockies, with fires being highly variable in severity and size. Not all ecosystems or all Rocky Mountain landscapes have experienced the impacts of fire exclusion as yet; the lack of impacts may not yet be manifested at the stand level, but are detectable at the landscape level (Keane et al. 2002). Whitebark pine survives low intensity fires but still benefits from stand replacing fire where regeneration is most successful. Arno (1986) suggests that fire is important in perpetuating an abundance of whitebark pine.

Whitebark pine was designated in 2011 as a sensitive species in the Northern Region (USDA Forest Service 2011) and is addressed in the Sensitive Plant section p. 128.

Desired Condition

Desired condition is a portrayal of the land, resource, or social and economic conditions that are expected to result in 50-100 years if objectives are achieved. It is a vision of the long-term conditions of the land (Forest Plan, p. 286). The desired condition for the project area is to maintain or improve resilient forest conditions (Forest Plan, p. 43), which is the capacity to return to prior conditions after disturbance. Resilient forests are those that not only accommodate gradual changes related to climate but tend to return toward a prior condition

[24] "Gap-phase" dynamics is defined where the patchy mortality of mountain pine beetle outbreaks create numerous forest openings and canopy gaps of varying sizes, which then allows for natural regeneration to become established (Larsen and Kipfmueller 2010).

after disturbance either naturally or with management assistance. Within the BDNF, maintaining a diversity of tree species or dominance types, age or size class diversity within dominance types, and forest density similar to what historic disturbance regimes produced, are considered underpinnings of a resilient forest (Forest Plan, p. 299). In all forest types, seedling and sapling development and management of stand densities allows for achieving resilient vegetation communities.

In Douglas-fir and ponderosa pine stands, the desired condition is to have larger diameter (up to 30 inches d.b.h.), open, grown, wide-spaced old trees (Joy and Hutton 1990) in stands averaging 60-80 square feet per acre of basal area and a range from 40-100 square feet per acre. Many of these stands would be old growth (per Green et al.), with more than 20 percent of the stands being comprised of ponderosa pine. Periodic thinning or low intensity prescribed fire would be considered in order to maintain the desired stand densities. These stands would be resilient to inherent insect and fire disturbances. Smaller trees would be scarce or occur mainly in openings (as individuals or in clumps) within the tree canopy; openings are natural and would be expected throughout these types. Shrubs and forbs would be common and would be similar to current understory vegetation. Species composition favors ponderosa pine, though the dominate species would be Douglas-fir with the potential for other species such as subalpine fir, lodgepole pine, and Engelmann spruce to be present. Aspen clones would have adequate growing space where they occur and are a healthy component of these Douglas-fir dominated stands. Ponderosa pine and Douglas-fir are long-lived which allows for stand replacement over long periods, and in most cases with partial forest canopy in place. The Forest Plan objective for the dry-forest habitat types is to reduce stand densities in the large size classes of Douglas-fir/dry forest communities to maintain or improve resilient forest conditions (Forest Plan, p. 43).

The desired forest condition for lodgepole pine is to perpetuate open to moderately dense stands averaging 80 square feet of basal area with a range of 60 to100 basal area (Schmid and Mata 1992; Schmid and Amman, 1992), at 6 to 12 inches d.b.h., and intermixed with Douglas-fir and minor representation of spruce and/or subalpine fir. Overall stand structure for lodgepole pine stands would continue to be even-aged, single-storied structure with occasional mature Douglas-fir; increase Douglas-fir component to the extent possible increasing species diversity. Stand density would be managed to perpetuate a more open and relatively evenly spaced stand of lodgepole pine to improve individual tree growth and vigor; reduce crown fire potential; promote younger age class of wind-firm, bark beetle-resistant lodgepole pine; and increase the quantity of longer-lived species such as Douglas-fir and aspen. The desired composition mix is mostly lodgepole pine, Douglas-fir and aspen, with an occasional Engelmann spruce and subalpine fir. Understory vegetation would be similar to what currently exists on site. In addition to increasing the resiliency of these stands (Forest Plan, p. 43), the Forest Plan objective for the lodgepole pine type is to increase the number of acres in the 0-5 inch d.b.h. class where insect-infested stands are dead or dying (Forest Plan, p. 44).

The desired condition for mid-elevation mixed-conifer stands is to maintain a patch mosaic of forested size classes. Forest vegetation structure provides the basis for maintaining or restoring forested ecological communities of sufficient diversity to provide for the viability of the majority of species that occur or make use of the forested types on the BDNF (FP FEIS p. 473). Creating openings suitable for early seral conifer species establishment, such as lodgepole pine and whitebark pine, is one objective with this desired condition. Although this proposal targets mid-elevation stands rather than high-elevation stands, there would be opportunities for whitebark pine establishment (which is highly desired) through Clark’s nutcracker seed

caching. Fires would ensure a richer mosaic of stands in different successional stages, contributing to the long-term viability of the early seral whitebark pine (Murray et al 2000) and lodgepole pine.

Environmental Consequences

Methodology

This analysis will consider the projected trends for Douglas-fir/ponderosa pine, lodgepole pine and whitebark pine vegetative communities with the absence of treatment (no action) and the action alternatives.

The Forest Vegetation Simulator (FVS) modeling was used to estimate the 50-year-trend for these stands. FVS is one of the most widely used forest management growth models, and simulates a wide array of different forest processes, including natural disturbance process such as insects, and includes a fire and fuel extension. The fundamental disadvantage of any forest yield model is that it is not linked to the underlying causes of productivity: carbon and nutrient cycles, moisture regime, and climate (Monserud 2003).

Spatial and Temporal Context for Effects Analysis

The spatial vegetation analysis area encompasses 44,522 acres (Forest Service ownership 37,010 acres; private ownership, 7,512 acres); in essence, the project area is National Forest System lands on the entire north end of the Flint Mountain Range. The analysis area includes all proposed activities, and is within the Flint Foothills Management Area and Flint Uplands Management Area. The temporal timeframe covers the span of time in which the effects of the proposed actions were analyzed. This period takes into account the cumulative effects of all actions up to the present, and extends into the future for 50 years.

Present and Foreseeable Activities Relevant to Cumulative Effects Analysis (table 24) at the beginning of chapter 3 discloses the present and reasonably foreseeable actions within the project area that are relevant to this DEIS analysis. The actions listed that are relevant to the vegetation section are: Public activities such as recreational activities, hunting, wildlife viewing and driving for pleasure; livestock grazing; invasive plant control, and roadside hazard tree removal.

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

The no-action alternative provides a means for evaluating the current ecosystem conditions as a baseline. In this alternative, proposed activities would not occur: salvage of dead and dying lodgepole pine stands by clearcut harvest, seed tree harvest, commercial thinning of Douglas-fir/ponderosa pine stands, precommercial thinning, and prescribed burning of low- and mid-elevation conifer stands. The direct, indirect, and cumulative effects of no action would be the forest stand progression trending away from the desired future condition.

Douglas-fir and Ponderosa Pine Vegetation Type

In absence of a stand-replacing fire event, Douglas-fir stands in the Flint Foothill Project area would continue to increase in density and canopy layering. Where the densest stands occur, individual trees of Douglas-fir and ponderosa pine may die (from competition or insects), continuing the current trend in the project area.

When Douglas-fir or ponderosa pine is killed by their respective beetle species, the tree attacked is usually one of larger diameter within the stand. The dead tree or groups of trees then create canopy gaps that provide opportunities for seedlings and sapling-sized trees to develop and increase in the stand; usually the size of these openings favors Douglas-fir regeneration. As stands progress over time, areas where there are gaps in the canopy would begin to fill in as Douglas-fir regeneration is established and trees grow, resulting in a decline in other species such as the early seral ponderosa pine, aspen, brush, and other herbaceous vegetation. The density of trees within the project area would increase causing a decline in individual tree vigor.

In approximately 60 to 80 years, it is possible that some of the Douglas-fir stands may attain old-growth characteristics (Koch 1996). Forest Vegetation Simulator indicates that current stands that are mature stands with 15-inch dominant trees would not attain old-growth characteristics in a 50-year period due to mortality from Douglas-fir bark beetles (appendix B of the Vegetation Report in the project file).

Existing old growth may be reduced due to mortality to large trees from beetles, with large ponderosa pine trees potentially becoming scarce due to mountain pine beetle. Fifty-year-trend modeling (with FVS) of one stand that is currently old growth estimated a reduction of ponderosa pine and the stand losing enough large trees to fall out of old growth status (appendix B of the Vegetation Report in the project file). The future trend due to beetle-caused large tree mortality is for fewer acres of low-elevation old growth in the project area.

Continued disruptions of the past mean fire interval of 20 years would affect forest structure and composition. The lack of fire coupled with insect disturbances and individual stand dynamics continue to favor increasing densities and layering of Douglas-fir, and discriminate against the early seral species ponderosa pine. Forest Vegetation Simulator modeling (appendix B of the Vegetation report in the project file) shows that with one fire disturbance, ponderosa pine increases in presence within the stand, and without fire is reduced.

Increasing Douglas-fir stand density and the multi-layering of Douglas-fir trees would allow western spruce budworm and Douglas-fir bark beetle to continue to kill large Douglas-fir trees. The heavy and repeated defoliation from western spruce budworm may lead to additional increases in Douglas-fir bark beetle activity. An increase in other bark beetles (specifically mountain pine beetle and western pine beetle) in ponderosa pine can be contributed to the sustained and increasing stand densities and associated loss in individual tree vigor due to competition from principally Douglas-fir (see Figure 13 and Figure 14).

Dramatically higher stand densities and development of ladder fuels increase the risk of wildfire, bark beetle infestations, and in some areas, successional replacement by shade-tolerant competitors (Fiedler et al 2010). It is expected that with the no-action alternative, mortality in Douglas-fir and ponderosa pine in the project area would not only continue, but increase. An increase in mortality is expected given the current trend in local climatic conditions coupled with the current dense and multi-layered stand conditions common in the Flint Foothill area for the Douglas-fir and ponderosa pine vegetation community.

Figure 18 and figure 19 that follow are photographs of stands in the project area showing loss of individual tree vigor and mortality due to understory competition.

Figure 18. A large-diameter live ponderosa pine with Douglas-fir underneath crowding the pine. Dunkleberg Creek area.

Figure 19. A large-diameter ponderosa pine tree killed by mountain pine beetle. A thicket of small Douglas-fir crowds the pine. Dunkleberg Creek area.

Lodgepole Pine Vegetation Type

Lodgepole pine stand conditions in the Flint Foothills Project area are conducive for continuing the epidemic populations of mountain pine beetle, and without a change in over-winter temperatures to colder extremes, the beetle attacks would continue until the host species of the appropriate diameter (about 5 inches and larger) have been exhausted. This trend epidemic has been seen on other locations nearer to the epicenter of the epidemic in the Butte area of the BDNF. Table 25 shows that all (about 100 percent) of the 18,142 acres of the lodgepole pine type greater than 5 inches d.b.h. has been affected by mountain pine beetle within the Flint Foothills Project area on NFS lands,

Incidental mature lodgepole pine escaping attack by mountain pine beetle would grow vigorously; other species that occur in the stand (Douglas-fir, subalpine fir, Engelmann spruce and aspen) would also see increased growth. Understory herbaceous vegetation (grasses, shrubs, and forbs) has thrived with the increased sunlight with the majority of the lodgepole pine overstory now dead. Natural regeneration has already begun in ‘canopy gap’ areas where enough warming sunlight has opened serotinous lodgepole pine cones. This natural regeneration would continue in the lodgepole pine type.

In time the dead trees would fall over (5-15 years) (Mitchell and Preisler 1998), resulting in large surface fuel accumulation. This fuel accumulation would be variable, but is estimated to be between 40 and 80 tons per acre of 5-inch and larger material, with some areas exceeding 100 tons per acre of material. Over decades, when there is a significant component of large down wood, there would be an increase in fire severity during high-intensity fire events (Jenkins et al. 2007). As the fuel load changes from standing dead to a horizontal profile, the natural regeneration would have physical barriers, and coupled with the staggering in time of canopy gaps, create a variable height and age lodgepole pine stand, with scattered older trees of the few lodgepole pine trees not affected by MPB and other species of trees. This progression with the lodgepole pine type is expected to occur on about 17,000 acres within the project area.

The extent of the bark beetle epidemic and lodgepole pine tree mortality in the Flint Foothills area would result in a profound change in the condition and arrangement of forest biomass (Kaufmann et al. 2008). Crown fires are possible both before an epidemic and while the red needles remain on the trees (ibid). Mortality due to the mountain pine beetle epidemic changes the fuel complex or characteristics in terms of fuel load and structure, microclimate and fuel moisture, and fire potential. These characteristics vary with the intensity of the beetle attack, initial stand conditions, and the time following the attack.

The 50-year-trend for lodgepole pine vegetation type, as modeled with FVS (appendix B of the Vegetation report in the project file), is for small (mean) diameter stands that would have some variability in size due to the regeneration being impeded by the horizontal profile of downed trees from the mountain pine beetle epidemic. This would result in most lodgepole pine vegetation type stands in the project area to be coming into the mid-seral pole-sized size class right at year 50.

Mixed Conifer Vegetation Type

The mountain pine beetle epidemic would continue to kill whitebark pine, especially individual trees stressed from white pine blister rust. However, with whitebark pine occurring at higher elevations, the colder climatic conditions may prevent all of the mature whitebark pine trees from being killed; this is a different potential trajectory in the project area as compared to lodgepole pine. The resulting fuel profile associated with dying pine trees within the mixed conifer vegetation type is more complex than that described in the lodgepole pine type. Accumulation of dead fuel would be in juxtaposition with live fuel, rather than the more straightforward accumulation of dead fuel loading with pure lodgepole pine stands.

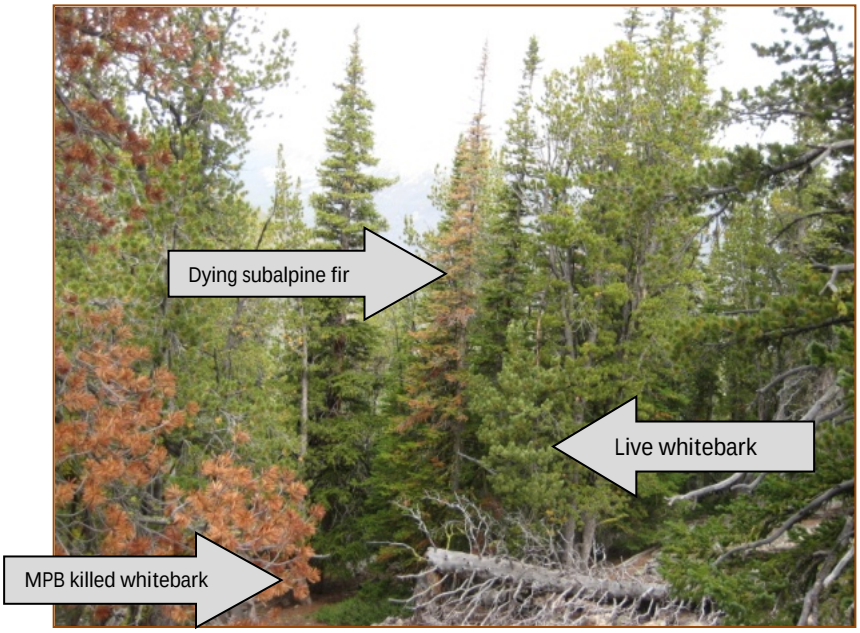


Figure 20. Mix of live and dead whitebark pine with live and dying subalpine fir; little opportunity for early seral whitebark pine establishment

Fires that burn at higher elevations are known to have beneficial effects to whitebark pine with the potential for whitebark pine natural regeneration (Arno 1986; Morgan et al 1994; Murray et al 2000; Keane 2000; Keane and Parsons 2010).

Additionally, there is a strong relationship between rates of whitebark pine killed by mountain pine beetle and whitebark pine regeneration density that indicates that stand-scale gap-phase dynamics may be one response to mountain pine beetle outbreaks (Larson and Kipfmueller 2010). Forestwide monitoring has shown a substantial amount of whitebark regeneration

established under more pure whitebark pine stands with mountain pine beetle mortality (USDA Forest Service 2011).

However, in more mixed conifer stands on the BDNF, blister rust and mountain pine beetle have accelerated succession to subalpine fir by killing mature whitebark pine, with a lack of adequate gap-size to allow whitebark pine natural regeneration to occur. It is anticipated that the dynamics in mixed-conifer stands with blister rust and mountain pine beetle mortality to whitebark pine, and mountain pine beetle mortality to lodgepole pine, coupled with the lack of fire as a recycling agent, would cause a major shift in landscape composition and structure from one of pine to fir and spruce (Keane 2000) (figure 20).

As most of the mixed conifer vegetation type includes a large component of lodgepole pine, the 50-year-trend for lodgepole pine vegetation type, as modeled with FVS (appendix B of the Vegetation report in the project file) is for small (mean) diameter stands that would have some variability in size due to the regeneration being impeded by the horizontal profile of downed trees from the mountain pine beetle epidemic. The fuel profile trajectory created from the current mountain pine beetle epidemic is projected by FVS to be relatively unchanged in 50 years. The trend is that most of the lodgepole pine in the mixed conifer type stands would be attaining mid-seral, pole, size class at year 50. Forestwide monitoring show as whitebark pine seedlings are expected to become established under more pure stands or pockets of whitebark pine, these trees would likely still be sapling size, or early seral condition. Fir and spruce are expected to become well established in the partial shade conditions of mixed-conifer vegetation types, and in 50 years are expected to be the dominant species.

Forest Carbon Cycling and Storage

The acreage of lodgepole pine forests currently affected by the mountain pine beetle epidemic is extensive throughout the Flint Foothill project area. As a major disturbance on the landscape, the mountain pine beetle epidemic and associated large-scale lodgepole pine mortality is affecting overall forest structure, development, and forest carbon storage. Due to the amount of recent dead and dying trees, it is estimated that there would be a decrease in the net ecosystem productivity (NEP) with the no-action alternative. This assumption is based on recent scientific literature on forest carbon storage, which is discussed more in this section.

These stands have been converted from a carbon sink to a carbon source to the atmosphere. Under the no-action alternative, these areas would remain that way until the carbon uptake by new tree regeneration exceeds the emissions from decomposing dead organic material. Barring a large-scale fire, these stands would likely remain a carbon source for several years or longer depending on the amount of dead biomass left on the site, the length of time before new trees become re-established, and their rate of growth once trees start to grow. As new trees become established, the amount of carbon would accumulate rapidly for several decades. The net ecosystem productivity would increase until reaching an intermediate age, then gradually begin declining but remain positive until impacted by future disturbances (Law et al. 2003).

Recent scientific literature confirms some general patterns of forest carbon storage and release over the period of forest stand development and natural or induced disturbances. For large-scale context, our nation’s forests have and continue to sequester vast amounts of carbon (nationally they are a net carbon sink, sequestering far more carbon than is released), equivalent to approximately 10 percent of annual carbon dioxide emissions from burning fossil fuels (Heath and Smith 2004; Birdsey et al. 2006).

Law et al. (2003) looked at changes in carbon storage and fluxes for ponderosa pine stands in central Oregon. They evaluated the net ecosystem productivity, which is the balance between being a net carbon source and net carbon storage (referred to as carbon sink). Their evaluation concluded that net ecosystem productivity is lowest and negative (carbon source) in young stands (9 to 23 years), moderate in young stands (56 to 89 years), highest in mature stands (95 to 106 years), and low in old stands (190 to 360 years). Most mature and old stands remained a net sink of carbon.

Pregitzer and Euskirchen (2004) synthesized results from 120 separate studies of carbon pools and carbon fluxes for boreal, temperate, and tropical biomes. They found that in temperate forests, net ecosystem productivity is lowest (more towards source) and most variable in young stands (0 to 30 years), highest (more towards carbon sink) in stands 31 to 70 years, and declines thereafter as stands age. These studies also reveal a general pattern of total carbon stocks declining after disturbance, increasing rapidly during intermediate years, and then declining over time until another significant disturbance (timber harvest or tree mortality resulting from drought, fire, insects, disease or other natural disturbances) kills large numbers of trees and again converts the stands to a carbon source. In this situation, carbon emissions from the decay of dead biomass exceed the amount of carbon removed from the atmosphere by photosynthesis within the stand. Over the long-term (centuries) net carbon storage is often zero if stands regenerate after disturbance because re-growth of trees recovers the carbon lost in the disturbance and in decomposition of trees killed by the disturbance (Kashian et al. 2006).

Because mountain pine beetles kill larger lodgepole pine trees preferentially, these killed trees represented proportionally larger values of carbon stocks (sequestration) and above-ground tree carbon production in killed trees within stands; more and larger trees killed results in greater decreases in carbon sequestration. Stand-level carbon can be recovered to pre-outbreak values in 25 years or less; it takes 50 to160 years to recover to values shown in simulations where stands were not attacked. The size distribution of surviving trees can shorten this timeframe; a greater number of smaller trees store carbon at a greater rate through an amplified growth rate when compared to larger survivors, having a greater capacity to take advantage of increased resource availability (Pfeifer et al. 2010). Successful tree regeneration is a much more critical factor in recovering carbon than stand age class distribution or tree density. As long as post-disturbance lodgepole pine stands support enough trees to have the structural characteristics of forests rather than shrublands, grasslands, or other kinds of non-forest vegetation, they would recover pre-disturbance carbon stocks quickly and the landscape would be resistant to long-term changes in carbon storage (Ryan et al. 2008).

For the short term, onsite carbon stocks may remain higher under the no-action alternative than under the action alternatives. Nevertheless, caution is advised against interpreting carbon inventory maintenance or gains from deferred or foregone timber harvest in any specific forest or stand as affecting atmospheric concentrations of greenhouse gases. This only holds true if harvest does not occur elsewhere in the world to supply the same world demand for timber (Gan and McCarl 2007; Murray 2008; Wear and Murray 2004). The result can be a net carbon impact if the timber is replaced in the marketplace with higher carbon source products such as steel or concrete or is harvested in a manner that does not result in prompt reforestation (Ryan et al. 2010; McKinley et al. 2011; Harmon 2009).

The risk of some high mortality disturbance events is greater under the no-action alternative. The long-term ability of forests to persist as net carbon sinks is uncertain. Drought stress, forest fires, insect outbreaks and other disturbances may substantially reduce existing carbon stock

(Galik and Jackson 2009). Climate change threatens to amplify risks to forest carbon stocks by increasing the frequency, size, and severity of these disturbances (Dale et al. 2001; Barton 2002; Breashears and Allen 2002; Westerling and Bryant 2008; Running 2006; Littell et al. 2009; Boisvenue and Running 2010). Recent research indicates that these risks may be particularly acute for forests of the Northern Rockies (Boisvenue and Running 2010). Increases in the severity of disturbances, combined with projected climatic changes, may limit post-disturbance forest regeneration, shift forests to nonforested vegetation, and possibly convert large areas from an existing carbon sink to a carbon source (Barton 2002; Savage and Mast 2005; Allen 2007; Strom and Fulé 2007; Kurz et al. 2008a; Kurz et al. 2008b; Galik and Jackson 2009). Providing for prompt reforestation after disturbance ensures that forests become sinks again in the future and can speed carbon recovery. The no-action alternative foregoes such climate change adaptation actions.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Precommercial Thinning of Old Harvest Areas

Precommercial thinning would be used to treat naturally regenerated and planted trees in previously harvested stands in 20 units totaling 1,048 acres. Ponderosa pine, Douglas-fir and then lodgepole pine (in order of preference) would be retained to enhance species diversity, thereby improving long-term resiliency of these stands. Trees would be thinned to a 9-foot to 16-foot spacing (500 to 300 trees per acre respectively). Branches would be lopped and scattered.

The objective of the thinning in old harvest units (1960s through 1970s) is to increase growth and improve resiliency by reducing stand density with the proposed treatment (FP p. 43). Current stocking in these areas is quite variable, ranging from 300 to 1,000 trees per acre. The best trees (defined as free-growing and full crowned) would be retained. These old harvest areas are principally lodgepole pine sapling-sized stands, although some units have other conifers, specifically Douglas-fir, ponderosa pine, subalpine fir and Engelmann spruce.

The direct effect would be cutting 0 to 500 trees per acre, retaining about 300 to 500 trees per acre, with an average of about 400 trees per acre. The indirect effect would be to improve growing conditions for the remaining trees, thereby increasing resiliency. FVS modeling has indicated that in 50 years these stands would be mid- to late-seral sized (small sawtimber) stands of trees.

Commercial Thinning Douglas-fir and Ponderosa Pine Stands

The proposed prescription for the commercial thinning of Douglas-fir and ponderosa pine stands is to reduce the current stand densities that average between 90 to 220 square feet of basal area per acre (figure 21) to an initial, post-harvest density that averages between 40 to 60 square feet of basal area per acre (figure 22) over approximately 1,149 acres. Old-growth stands would have a higher basal area retained, and is discussed in more detail below. Basal area is a measurement of stand density, where a given area of trees is described by the cross-section (in square feet) of those trees. Thinning activities would cut the overstory (sawlog-sized) trees up to 20 inches in diameter. No trees greater than 20 inches would be cut. Table E-1 and E-2, in volume 2 appendix E display the attribute summaries of the stands proposed for treatment.

Additionally, the proposed prescription would remove most of the smaller trees (less than 4 inches in diameter), principally through an understory burn after the proposed thinning. Although basal area is the measure used for density in this analysis, the less than 4-inch size trees can account for a high level of tree stocking on an individual stand basis. An example of this is in Unit 59C, where 240 trees per acre with an average diameter of 1 inch account for less than 2 square feet of basal area of the total basal area for the stand.

Figure 21. Dense Douglas-fir in background with scattered large dead trees killed from bark beetles, Unit 20C

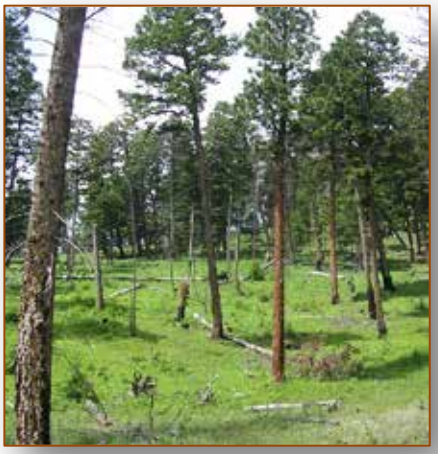


Figure 22. Desired condition; widely spaced large trees, 1990s era harvest, Blum Creek area

The proposal would convert dense (high basal area) and multi-storied stands (layering of different aged trees) into open, grown, widely spaced trees. The resultant post-treatment stand structure would be similar to what would have been created with the 20-year interval fire disturbance regime described in the existing condition of this analysis. Treatments that approximate desired conditions create relatively open, large-tree dominated structures primarily composed of seral species (Feidler et al. 2010). Poor growth, high stand densities and the amount of Douglas-fir are correlated to infestation levels of Douglas-fir bark beetle (Fettig et al. 2007). Slow growth and tree competition (with a reduction in tree vigor with increases of stand density) are also correlated to MPB levels in ponderosa pine, with thinning to reduce tree competition and increase individual tree growth potentially being critical for long term prevention of mountain pine beetle outbreaks in ponderosa pine (Fettig et al. 2007).

Post thinning conditions would find widely spaced large trees with smaller trees scarce or occurring as clumps in openings within the tree canopy. Shrubs and forbs would be common, but low growing. Surface fuels would be at 12 to 15 tons per acre. Species composition would favor ponderosa pine, although Douglas-fir is common with other species present such as aspen, lodgepole pine and Engelmann spruce. Aspen clones would be provided adequate growing space where they occur, with conifers less than 20 inches in diameter removed within and adjacent to the clone.

A total of 121 acres of old-growth stands are included in the commercial thinning treatments; these acres would meet minimum criteria for old growth after treatment, consistent with Forest Plan standards (FP p. 44). Old growth is defined using the minimum criteria required in Green

et al., errata corrected 2007 (page 12 of that document, which is Table 3: Eastern Montana Zone Old Growth Type Characteristics). Table 32 that follows discloses the pre- and post- treatment minimum criteria conditions of each proposed unit, and that the post treatment conditions would still meet the criteria of old growth.

Table 32. Inventoried old growth in proposed units with the minimum criteria pre-and post-treatment

Stand	Unit	Total Unit acres	Inventoried Old Growth Acres	Percent of Unit	Old Growth Type	Age[25]		Number of Trees/d.b.h.[26]		Basal Area per acre >5"d.b.h.[27]	
						Pre	Post	Pre	Post	Pre	Post
85202025	6C	14	2	14%	2-DF	211	211	6.7	6.7	120.0	60-80
85202013	23C	69	36	52%	2-DF	230	230	11.1	11.1	116.7	60-80
85202029					2-DF	210	210	5.7	5.7	88.0	60-80
85301060	25C	64	26	41%	1-DF	251	251	4.8	4.8	87.5	60-80
91104009	55C	175	57	33%	2-DF	219	219	6.2	6.2	144.0	60-80
91104008					2-DF	224	224	6.7	6.7	140.0	60-80
91104038					2-DF	205	205	5.6	5.6	140.0	60-80

Post thinning conditions for the old growth stands are as described above, with widely spaced large diameter trees retained at 60 to 80 square feet of basal area with small trees primarily occurring in clumps. Additional younger, mature large trees would be retained to perpetuate large trees on the site (hence, the higher basal area retained over the non-old growth commercial thin units). The old growth structural attributes would change from a multi-storied stand with layers of different sized trees to a single-storied, large-diameter stand with small pockets of seedling to sapling trees. One example of a high amount of understory is in Unit 25C where 150 trees per acre are currently under the large diameter, old growth trees. This understory would be mostly removed with this proposal, converting the multi-story canopy stand to a single-story canopy stand with small pockets of seedling-sapling sized trees.

The desired result of developing resilient old growth conditions through management techniques is to maintain composition and structure that conforms to the Green et al. old growth definition (FP FEIS p. 1052) reversing the trend described in alternative 1 where larger diameter trees succumb to bark beetles, and existing old growth stands may become non-old growth. FVS modeling of stand 85202013 within Unit 23C indicates that without treatment and continued high MPB activity, the stand would fall out of old growth status in 50 years with a reduction of ponderosa pine in the stand. The 50-year-trend (using FVS modeling) for prescribing a thin with the same old growth stand and high MPB activity indicates that the stand would still be old growth in 50 years, and the ponderosa pine component would increase.

The direct effect for the 1,149 acres of commercial thin would be the cutting down of about 50 to 160 square feet of basal area of principally Douglas-fir (with salvage of dead lodgepole in

[25] Age from Green et al for both old growth types is a minimum of 200 years old for the large trees. As the large trees would be retained, the age post treatment would remain the same.

[26] The number of trees per acre are a minimum of 4 >or= to 17"d.b.h.for OG Type 1 and 5 >or= to 19"d.b.h. for OG Type 2 (Green et al. 2007). As the large trees would be retained, the number of trees per acre above the minimum diameter would stay the same.

[27] Minimum basal area for both old growth types in this proposal is 60 square feet (Green et al. 2007).

some units) and removal of most of the smaller diameter understory. The indirect effect would be to improve growing conditions for the remaining trees, thereby increasing resiliency and promoting opportunity for quicker development of old growth stands where the minimum criteria is not met, and perpetuating old growth for the long term where currently there is old growth.

In addition, a direct effect would be the removal of conifer competition to upland aspen clones, which would indirectly improve growing conditions for aspen and creating the opportunity for seedlings to develop into large trees.

The 50-year-trend for the commercial thin non-old-growth stands would be large, open, grown ponderosa pine and Douglas-fir stands that are resilient to inherent disturbance regimes (insects and fire) as is described in the Desired Condition section of this analysis (figure 23). Widely spaced large trees with improved growing conditions for aspen, 1980s-era harvest, Blum Creek area; this is about 25 years on the 50-year desired trajectory for the proposed commercial thin units.). FVS modeling of a commercial thin and prescribed burn (appendix B in the Vegetation Report in the project file) shows that in 50 years there would be widely spaced trees (up to 30+ inches in diameter with basal area ranging from 40 to 100 square feet per acre).

Figure 23. Desired condition after commercial thinning

An increase of ponderosa pine resulting from the proposed treatments is shown with FVS modeling. If the non-old growth stands meet age requirements per Green et al. in 50 years, these stands would be classified as old growth, as FVS modeling indicates they would meet the structural definitions. Mean diameters for these stands would more than double, which means that smaller trees are not common or if present, occur in openings within the tree canopy, and that there are larger diameter trees than without treatment. Shrubs and forbs are common, but are low growing. Species composition favors ponderosa pine, although Douglas-fir is common with other species present such as aspen, lodgepole pine and Engelmann spruce. Aspen clones are provided adequate growing space where they occur, and are a healthy component of these thinned stands in 50 years. Without additional future disturbances that are similar to the natural fire intervals of the past, the stand would revert back to the stand conditions described in the no-action alternative

Forest Plan Wildlife Standard 3 (Forest Plan, p. 48) is met in the Douglas-fir commercial thinning treatments under alternative 2, as no trees (dead or alive) larger than 20 inches diameter would be removed. Forest Plan Wildlife Standard 4 (Forest Plan, p. 48) does not apply to this treatment type. Snag inventories outside of the proposed treatment units were not conducted.

Seed Tree with Reserve Trees in Douglas-fir and Ponderosa Pine Stands

The prescription for the proposed 353 acres of seed tree harvest with reserve trees is to retain ponderosa pine and Douglas-fir seed trees at about 5 to 15 trees per acre. All trees greater than 20 inches d.b.h. would be retained, with additional trees kept to maintain a distribution of seed trees across each unit; preference for retention are ponderosa pine over Douglas-fir leave trees. Ponderosa pine seedlings would be planted after the harvest has been completed. See table E-1 in volume 2 appendix E for an attribute summary of the stands proposed for seed tree harvest.

The seed tree harvest would create an early seral component of ponderosa pine leaving large diameter ponderosa pine and Douglas-fir as seed trees. The seed tree harvest would remove much of the understory; light underburning would remove the remaining ladder fuels not removed with harvest. Collectively, this would reduce stand density to between 20 and 40 square feet of basal area, which would lower the hazard for bark beetles on the remaining ponderosa pine. Not all of these stands are a pure ponderosa pine/Douglas-fir type; some stands contain a component of bark beetle-infected lodgepole pine which would be a salvage component within the seed tree harvest. The final action in these units would be planting ponderosa pine seedlings to increase the pine component over the long term of these units.

Post seed tree harvest conditions would find widely spaced large trees with about 400 ponderosa pine seedlings planted per acre. Shrubs and forbs would be common, but low growing. Surface fuels would be at 12 to 15 tons per acre. Aspen clones would be provided adequate growing space where they occur, with conifers less than 20 inches in diameter removed within and adjacent to the clone. All trees less than sawlog size would be removed and brought to a landing for disposal (either as biomass, firewood, or other product).

The direct effects from seed tree harvest would be cutting of about 0 to 200 square feet of basal area, principally Douglas-fir (with salvage of dead lodgepole pine in some units), with about 20 to 40 basal area retained (5 to 15 trees per acre). An additional direct effect would be a change in species composition to predominately ponderosa pine with some Douglas-fir after the planting has been completed. The indirect effect would be to improve growing conditions for the remaining trees to create optimal growing conditions for the planted ponderosa pine. As well as to remove conifer competition to upland aspen clones, which would indirectly improve growing conditions for aspen and create the opportunity for seedlings to develop into large trees.

The 50-year-trend for the seed tree harvest would be large, open, grown ponderosa pine and Douglas-fir stands that are resilient to inherent disturbance regimes (insects and fire) as is described in the Desired Condition section of this analysis. FVS modeling (appendix B of the Vegetation Report in the project file) shows that in 50 years there would be widely spaced large Douglas-fir and ponderosa pine trees, (over 30 inches in diameter with basal area ranging from 20 to 60 square feet per acre). The planted ponderosa pine would be over 7 inches in diameter and growing vigorously. Shrubs and forbs are common, but are low growing. Species composition in 50 years would be primarily ponderosa pine with some Douglas-fir, aspen and lodgepole pine. Aspen clones are provided adequate growing space where they occur, and are a healthy component of these thinned stands in 50 years.

Forest Plan Wildlife Standard 3 (Forest Plan, p. 48) is met in the seed tree harvest with reserve tree treatments under alternative 2, as no trees (dead or alive) larger than 20 inches diameter would be removed. Forest Plan Wildlife Standard 4 (Forest Plan, p. 48) would also be met

through the retention of the seed trees and reserve trees with this treatment type. Snag inventories outside of the proposed treatment units were not conducted.

Salvage by Clearcut Harvest of Dead and Dying Lodgepole Pine Stands

The proposed prescription for the 1,163 acres of dead and dying lodgepole is to conduct salvage by clearcut harvest of the dead and dying lodgepole pine trees, retaining all other species that occur in the units. See table E-1in volume 2 appendix E for an attribute summary of the stands proposed for salvage by clearcut harvest.

The current mortality sets the stage for the next age class of naturally regenerated lodgepole pine stands throughout the project area. This proposal changes the trajectory described in alternative 1 only for the salvage by clearcut activities on the proposed 1,163 acres, thereby removing what is now a vertical fuel structure that would fall over in 5-15 years (Mitchell and Preisler 1998), resulting in large and variable horizontal fuel accumulation that would be about 40 to 80 tons per acre of 5-inch and larger material, with some areas exceeding 100 tons per acre of material.

This proposed treatment would allow the new stands to develop without the physical barriers created by falling, jack-strawed logs, allowing future management of these stands such as thinning to improve stand health and vigor. This proposed action on 6 percent of the lodgepole pine acres increases the acres in the 0- to 5-inch d.b.h. class. The stand conditions created by salvage harvest are described in the Desired Condition section of this analysis; namely open to moderately dense stands averaging 80 square feet basal area with a range of 60 to 100 square feet basal area, intermixed with Douglas-fir and aspen, with minor amounts of spruce and/or subalpine fir. The harvested acres overtime (50 or more years) would create mid- to late- seral stands of larger diameter trees more quickly as compared to stands without harvest. The remaining 87 percent (all lodgepole pine acres except for the proposed action plus the acres of existing seedling stands) of the lodgepole pine vegetation type would continue on the projected trajectory described in the no-action alternative.

Alternative 2 has 15 units (12 with salvage by clearcut prescription, and 3 with seedtree harvest prescription) that exceed 40 acres (table 33). These units encompass past disturbance patterns, harvest, insect mortality, or fire. The compilation of these stands creates the different structural stages displayed in table 27 of this analysis. The 12 lodgepole pine units exceeding 40 acres are comprised of lodgepole pine stands created by past disturbance, rather than constrained by a certain size, i.e., the 40-acre limitation. Large patch sizes that comprise the units exceeding 40 acres provide the structure and arrangement of lodgepole pine forests that naturally occur in the Flint Foothills project area.

Standard 2 for Timber Management states that regeneration harvest operation shall not exceed 40 acres; harvest area may be larger than 40 acres after public notice, and review and approval by the officer one level above the responsible official. Alternative 2 has 15 units that exceed 40 acres in size (table 33).

The forest stands with past regeneration harvest adjacent the proposed units that exceed 40 acres are fully reforested and are no longer considered openings. The units that exceed 40 acres were designed to encompass past fire and insect disturbance patterns that created a patch mosaic of stands. Large patch sizes that comprise the units that exceed 40 acres provide the structure and arrangement of lodgepole pine forests that naturally occur within landscape that is the Flint Foothills Project area.

Table 33. Salvage by clearcut harvest and seed tree harvest units that exceed 40 acres in size

Unit #	Acres
19S	41
34S	78
35S	50
36S	61
39S	79
46S	79
49S	43
52S	94
58S	49
61S	88
73S	64
74S	74
1ST	102
5ST	47
27ST	139
Average (small, large)	73 (41,139)

This 1970s era clearcut is 53 acres in size, and surrounded by dead and dying mature lodgepole.

Figure 24. Example of an old harvest area (middle ground) in Ballard Hill area greater than 40 acres in size, surrounded by dead and dying lodgepole pine.

The direct effect is salvage by clearcut of all lodgepole pine greater than 5 inches in diameter (not to exceed 20 inches in diameter); these units would be large open areas (average size: 39 acres) with live trees consisting of Douglas-fir with occasional aspen, live lodgepole pine less than 5 inches diameter, and incidental occurrences of other conifer species. Less than 5 percent live canopy coverage would be expected to remain in the units after salvage by clearcut harvest.

The immediate increase in available light created through the salvage by clearcut treatments would stimulate understory vegetation including growth of seedling and sapling Douglas-fir, lodgepole pine, and aspen. The solar heating at ground level would open the lodgepole pine serotinous cones. By salvaging lodgepole pine rather than allowing the dead trees to fall to the forest floor, there would be an increase in the density and growth rate of the new stand thereby shortening the timeframe of establishment and subsequent growth than if these stands were not salvaged (Romme et al. 1986). FACTS[28] database queries show typical third-year stocking levels for stands in this area range from 100 to 300 trees per acre with a minimum stocking level for certification of 200 trees per acre. All stands are expected to be fully stocked within 5 years after completion of harvest units; Forest records indicate 94 percent of harvested stands reaching certification stocked with trees by natural regeneration, with the remaining 6 percent being planted trees to reach full stocking.

[28] The Forest Service Activity Tracking System (FACTS) is an activity tracking system for all levels of the Forest Service. It supports timber sales in conjunction with TIM Contracts and Permits; tracks and monitors NEPA decisions; tracks KV trust fund plans at the timber sale level, reporting at the National level; and, it generates National, Regional, Forest, and/or District Reports.

Old growth is defined using the minimum criteria required for eastern Montana old growth in Green et al. errata corrected 2007 (Forest Plan, p. 44). No proposed salvage by clearcut activities in old-growth or potential old-growth stands would occur. Because no treatment is proposed in old-growth stands, no old growth would be affected by salvage by clearcut harvest treatments.

Informal walk-through surveys were completed in the salvage by clearcut units; however, these surveys did not include snags. Snags were surveyed within 529 acres of stand exams completed in the lodgepole pine vegetation type. Table E-1, E-2 and E-3 in volume 2, appendix E display the results of those exams. Of the 18,142 acres of lodgepole pine type in the project area, an estimated 16,949 acres are pole size or larger (table 31). Virtually all of the lodgepole pine stands have been affected by mountain pine beetle; these dead trees are currently available for snags outside of the proposed treatment units. This proposal would reduce the amount available for snags by 1,163 acres (6 percent of the lodgepole pine type); however, the acres treated would meet the Forest Plan standards for snag retention. Forest Plan Wildlife Standard 3 (Forest Plan, p. 48) is met in the salvage by clearcut treatments under alternative 2, as no trees (dead or alive) larger than 20 inches diameter would be removed. Forest Plan Wildlife Standard 4 (Forest Plan, p. 48) would also be met through the retention of all live conifer trees other than lodgepole pine with this treatment type. Snag inventories outside of the proposed treatment units were not completed.

Over the next 50 years, stand density would be managed with precommercial thinning to perpetuate a more open and relatively evenly spaced stand of lodgepole pine to improve individual tree growth and vigor; reduce crown fire potential; promote younger age class of wind-firm, mountain pine beetle-resistant lodgepole pine; and increase the quantity of longer-lived species such as Douglas-fir and aspen. The 50-year-trend for the salvage by clearcut harvest of dead and dying lodgepole pine would be open to moderately dense lodgepole pine with minor amounts of other tree species in the stands that are resilient to inherent disturbance regimes (insects and fire) as described in the Desired Condition section of this analysis. FVS modeling (appendix B of the Vegetation Report in the project file) shows that in 50 years there would be fast-growing lodgepole pine at moderate densities. Shrubs and forbs would be common, but low growing. Species composition in 50 years would be primarily lodgepole pine with some Douglas-fir, aspen, subalpine fir, and Engelmann spruce.

Most of the lodgepole pine type in the project area would be in a mid-seral-pole size class due to the current mountain pine beetle activity in the project area. FVS modeling has indicated that stands that are not managed would have smaller mean diameters in 50 years than stands that are managed.

Prescribed Burn Mid-elevation Mixed Conifer and Dry Low-Elevation Forests

The proposal is to implement prescribed burning on 1,990 acres of mid-elevation mixed-conifer (lodgepole pine dominated) units and low-elevation dry-forest units. There are 1,259 acres of mid-elevation mixed conifer in three units, and 731 acres of low-elevation Douglas-fir and ponderosa pine stands in five units (table E-4, volume 2, appendix E, lodgepole pine stands.).

Prescribed burning would apply either aerial ignition (for mid-elevation burns) or hand-lighting (both mid-elevation mixed intensity and understory light intensity). Some hand-falling of trees may occur to facilitate burning objectives. Burning would occur when weather and ground conditions are suitable to maintain air quality and burning can be controlled; this timing may be in spring or fall. Ignitions may occur over multiple years.

Dead and dying pine species (lodgepole pine, ponderosa pine and whitebark pine) killed by mountain pine beetles, and ongoing defoliation by spruce budworm to Douglas-fir, set a trajectory of fuel loading (vertical and horizontal) and forest succession to fir species; this trajectory is described in the discussion for alternative 1.

Treatments in low-elevation, dry forests that approximate desired conditions (as described in the Desired Condition section) tend to create relatively open, large-tree dominated structures primarily composed of seral species; these treatments induce ponderosa pine regeneration, reduce tree density and expedite reintroduction of fire (Fiedler et al. 2010). Prescribed burning in low-elevation units with this proposal would return the fire as a disturbance process to the project area, and are designed to be low-intensity with fire ignited over the entire unit, reducing multi-layering understory trees and overall forest density. This action would allow for the ability to improve resiliency, resulting in stands more able to withstand bark beetle mortality and stand-replacing fire (Agee and Skinner 2005; Fettig et al. 2008). The Douglas-fir/ponderosa pine vegetation type in the project area historically experienced fires on frequent intervals, therefore, over time, fire disturbance as a management tool would improve long-term forest resilience; without additional future disturbances that are similar to the natural fire intervals of the past, these forest types would revert back to the conditions described in the no-action alternative.

The direct result from low-elevation prescribed fires would be burning grass, herb and shrub understory communities, along with killing seedling and sapling sized conifers in the understory. A few overstory trees (less than 5 percent) may also be killed from the understory burning. Spring burning would be more of an impact to the overstory trees, as the tree buds would be more susceptible to heat. Fall burning would be less of an impact as the tree buds would be hardened, and more able to withstand heat generated from burning. The indirect effect of low-elevation prescribed burning would be a regrowth of senesced grass, herb and shrub understory communities, increased vigor for remaining conifers, and natural regeneration of ponderosa pine. FVS modeling (appendix B of the Vegetation Report in the project file) indicates that in 50 years, understory burning would result in less-dense stands with larger mean diameters, and more ponderosa pine where it is present than compared to stands that had no burning.

Burning in spring would allow much more control over the spread of fire through ground vegetation. The fire effects from heat to conifers in a spring time burn would be greater, as conifers are more susceptible at that time due to their growing buds. Conifer buds harden in the fall, so trees would be less susceptible with a fall burn, but fire spread over the ground vegetation would be more difficult to control.

Although whitebark pine as a vegetation type is a small percentage (1.5 percent) of the project area, and is not the objective of proposed treatments, there may be an effect to whitebark pine with the mid-elevation burning. Whitebark pine is known to occur in all of the mid-elevation units (Unit 3B, 4B, and 5B). Potential effects would be to individual whitebark pine trees scattered in the proposed units, although the majority of the acres delineated are below the elevation of the more common occurrence of whitebark pine in the project area. Burning effects might include individual tree mortality. The felling of conifers prior to burning would avoid areas of units that have concentrations of whitebark pine. Additionally, ignition patterns would avoid the use of fire directly in areas of units that have concentrations of whitebark pine. Conducting the prescribed burn during spring conditions controls fire spread. The potential

effects to whitebark pine could be greater with fall burning, as fire spread with ground vegetation would be more difficult to control.

The direct effect of burning mid-elevation mixed-conifer (lodgepole dominated) stands would be killing overstory and understory conifers in a patch mosaic across the proposed unit. The fire would directly consume a portion of the existing vertical and horizontal fuel, some of which has been created by mountain pine beetles in the project area. Another direct effect would be limited burning in the grass, herb and shrub understory communities; the amount is limited due to spring burning conditions. Fall burning would directly affect more understory vegetation communities, providing more opportunity to rejuvenate these ground-cover species.

The indirect effect of mid-elevation prescribed burning in mixed conifer stands would be a regrowth of senesced grass, herb and shrub understory communities and natural regeneration of lodgepole pine and some whitebark pine.

Forest Carbon Cycling and Storage

The treatments in alternative 2 would reduce on-site carbon sources by removing the dead and dying lodgepole component that would release stored carbon during decomposition. Forested environments over time are renewable carbon sinks. Removing dead trees, allows overall carbon sequestration to increase more rapidly in the treated stands, when compared to the no-action alternative, by increasing the health and vigor of the remaining trees and understory vegetation, and by promoting regeneration of seedlings for the next stand. In general, such management actions as those proposed in the project could improve the resilience of forests to climate-induced increases in frequency and intensity of disturbances such as fire and insect and disease epidemics. Utilizing harvested trees for long-lasting forest products and renewable energy sources may help sustain the current strength of the carbon sink in U.S. Forests (Birdsey et al. 2006 and 2007).

In the short term, the proposed activities would release some of the carbon currently stored through the harvest of live and dead trees (USEPA 2010; Depro et al. 2008). Motorized equipment used during any of the proposed activities would emit greenhouse gasses. For the short term, on-site carbon stocks would be lower under the action alternatives than under the no-action alternative. Actions such as the proposed intermediate harvests may, in some cases, increase long-term carbon storage (Finkral and Evans 2008; North et al. 2009; Mitchell et al. 2009) but current research in this field shows highly variable and situational results (Mitchell et al. 2009; Reinhardt and Holsinger 2010; Ryan et al. 2010; McKinley et al. 2011). See also the discussion of forest carbon cycling and storage under the Affected Environment – Existing Conditions section.

The lodgepole pine stands recently killed by mountain pine beetle are estimated to be functioning as a net carbon source to the atmosphere. Removal of dead wood would reduce on-site carbon stores. The portion removed as wood products may partially delay carbon release relative to on-site decay rates. These stands would continue to emit more carbon than they absorb and would

Guidance on Consideration of Climate Change in Project-related NEPA

Forest Service Guidance – The Forest Service has prepared agency guidance on "Climate Change Considerations in Project Level NEPA Analysis" (http://www.fs.fed.us/emc/nepa/climate_change/includes/cc_nepa_guidance.pdf). In general, that guidance recognizes that while some actions may warrant qualitative or even quantitative analysis of the effects of an action on climate change, some actions are at such a minor scale that the effects would be meaningless to a reasoned decision. The 9th Circuit Court of Appeals recently agreed with that reasoning, finding that a project of similar scope as that proposed here did not warrant detailed analysis of the projects potential impacts on climate change (Hapner v. Tidwell, No. 09-35896 (9th Cir. 2010)).

Other Contextual Considerations – The top three anthropogenic (human-caused) contributors to greenhouse gas emissions (from 1970-2004) are: fossil fuel combustion, deforestation, and agriculture (IPCC 2007, p. 36). Land use change, primarily the conversion of forests to other land uses (deforestation), is the second leading source of human-caused greenhouse gas emissions globally (Denman et al. 2007, p. 512). Loss of tropical forests of South America, Africa, and Southeast Asia is the largest source of land-use change emissions (Denman et al. 2007, p. 518; Houghton 2005). This proposal does not fall within any of these primary contributors of global greenhouse gas emissions nor is it similar to the primary human activities exerting negative pressure on the carbon sink that currently exists in US forests. The affected forests will remain forests, not converted to other land uses, and long-term forest services and benefits will be maintained.

Additional discussion on considering climate change in projects is provided in the Vegetation report in the project file.

remain net carbon sources until trees that sequester additional carbon are well established. Monitored regeneration would help ensure these forest stands return to a carbon sink function as quickly as possible. As the stands continue to develop, the strength of the carbon sink would increase until peaking at an intermediate age and then gradually decline but remain positive (Pregitzer and Euskirchen 2004). Carbon stocks would continue to accumulate as the stands mature, although at a declining rate, until impacted by future disturbances.

To the extent the proposed actions reduce the risk or delay the event of future stand-replacing disturbance events, potential emissions from those events are equally reduced or forestalled. The vegetation treatments are designed to enhance forest resiliency to disturbances such as wildfire and insect outbreaks.

Sustaining forest productivity and other multiple-use goods and services requires that land managers balance multiple objectives. The long-term ability of forests to sequester carbon depends in part on their resilience to multiple stresses, including increasing probability of drought stress, high severity fires, and large scale insect outbreaks associated with projected potential climate change. Management actions (such as those proposed with this project) that maintain the vigor and long-term productivity of forests and reduce the likelihood of high severity fires and insect outbreaks can maintain the capacity of the forest to sequester carbon in the long-term. Thus, even though some management actions may in the near-term reduce total carbon stored below current levels, in the long-term they maintain the overall capacity of these stands to sequester carbon while also contributing other multiple-use goods and services (Reinhardt and Holsinger 2010).

Alternative 3

Direct and Indirect Effects

The direct and indirect effects would be the same for alternative 3 as discussed in alternative 2, with the following exceptions:

Commercial Thin Douglas-Fir and Ponderosa Pine Stands

The 483 fewer acres of commercial thinning in alternative 3 would see those acres develop on the trajectory described in alternative 1. The noteworthy difference in indirect effects is dropping old growth treatments; meaning, the 121 acres of tree density reduction where old growth is retained that would take place in alternative 2 would not take place in alternative 3. Dropping these treatment acres in alternative 3 would result in a likely conversion out of old growth status in the next 50 years. The 50-year-trend as indicated with FVS modeling of stand 85202013 within Unit 23C (in alternative 2) indicates that without treatment and continued high MPB activity, the stand would fall out of old growth status within 50 years with a reduction of ponderosa pine in the stand. The 50-year-trend (using FVS modeling) for prescribing a thin with the same old-growth stand and high MPB activity indicates that the stand would still be old growth in 50 years, and the ponderosa pine component would increase.

Salvage by Clearcut Harvest of Dead and Dying Lodgepole Pine Stands

The 141 fewer acres of salvage by clearcut harvest would see those acres develop on the trajectory described in alternative 1. The ability to manage those acres to maintain stand densities in the future, as described in the Desired Condition section of this analysis, would not take place. The potential to create mid- to late- seral stands of large diameter more quickly (as compared to stands without harvest) would not take place. The 141 acres would join the

remaining 87 percent of the lodgepole pine vegetation type on the projected trajectory described in the no-action alternative.

One of the units that exceeds 40 acres in size (36S) proposed with alternative 2 is dropped in alternative 3. Table 34 that follows displays all of the units in alternative 3 that exceed 40 acres in size. As in alternative 2, units that exceed 40 acres in alternative 3 were designed to encompass past fire and insect disturbance patterns that created a patch mosaic of stands. Large patch sizes that comprise the units that exceed 40 acres provide the structure and arrangement of lodgepole pine forests that naturally occur within the landscape that is the Flint Foothills Project area. The forest stands with past regeneration harvest adjacent to the proposed units that exceed 40 acres are fully reforested and are no longer considered openings.

Table 34. Salvage by clearcut harvest and seed tree harvest units that exceed 40 acres in size for alternative 3

Alternative 3							
Unit	**Acres**	**Unit**	**Acres**	**Unit**	**Acres**	**Unit**	**Acres**
19S	41	46S	79	61S	88	1ST	102
34S	78	49S	43	73S	64	5ST	47
35S	50	52S	94	74S	74	27ST	139
39S	79	58S	49				

Alternatives 2 and 3 Cumulative Effects

Cumulative Effects from Past, Present and Reasonably Foreseeable Future Actions

Table 24 at the beginning of chapter 3 discloses the present and reasonably foreseeable actions within the project area that are relevant to this DEIS analysis. In general, there would be no apparent cumulative effects on the project area vegetation from the sum total of past, present, and reasonably foreseeable actions when cumulatively added to either of the action alternatives. This is partly due to the small number of acres proposed for vegetative treatments (5,703 acres in alternative 2 or 13 percent of the project area; and 5,079 acres in alternative 3 or 11 percent of the project area) relative to the size of the analysis area (44,522 acres) and the type of activities proposed with known direct, indirect and cumulative effects within the project area. Over time, the types of activities that are proposed would recover the area (vegetation regrowth), which is currently observed in the project area from past harvest and prescribed burn activities.

Table 35. Measurement indicators (acres) compared by alternative for the old-growth issue

Measure	Alternative 1	Alternative 2	Alternative 3
Acres of lodgepole pine regenerated	0 acres	1,163 acres	1,022 acres
Acres of basal area reduction and growing conditions improved with thinning of Douglas –fir /ponderosa pine stand	0 acres	1,128 acres	666 acres
Acres of basal area reduction, growing conditions improved, and type change of old growth	0 acres	121 acres	0 acres

Measure	Alternative 1	Alternative 2	Alternative 3
from multi-story to single story			
Acres of Douglas-fir/ponderosa pine regenerated	0 acres	353 acres	353 acres
Acres of basal area reduction and growing conditions improved with low-intensity prescribed burning of low-elevation Douglas-fir and ponderosa pine stands	0 acres	731 acres	731 acres
Acres of lodgepole pine regenerated through prescribed burning in mid- to high-elevation lodgepole pine stands	0 acres	1,259 acres	1,259 acres
Growing conditions in young stands improved by reducing stand density in past timber harvest areas	0 acres	1,048 acres	1,048acres

Compliance with Forest Plan and other Relevant Laws, Regulations, Policies and Plans

Forest Service Guidelines

The Flint Foothill project is consistent with the Forest Service Manual and Handbook direction outlined in this analysis.

Forest Plan Consistency

The Flint Foothill project is consistent with the Forest Plan management area direction, and also is designed to meet vegetation goals and objectives within the plan

Air Quality

Introduction

Prescribed burning is subject to air quality standards by following federal and state regulations along with policies that focus on maintaining air quality standards through the management and control of emissions generated by human-caused activity. To help ensure that the Forest Plan and clean air goals are met, fire management practices that minimize emissions and impacts of smoke from prescribed burning must be considered.

Overview of Issues Addressed

Pile and under burning would occur 1) in landing areas and in the understory of commercial thin and seed tree units, and 2) in approximately 1,990 acres associated with prescribed burn units. Effects from prescribed burning in the project area may impact air quality in local Montana airsheds. Visibility in three nearby federally designated Class I areas (wilderness) could also be affected.

Affected Environment

Existing Condition

Airsheds

The Flint Foothills project area is located on the northern edge of Montana Airshed 5 (Upper Clark Fork) and adjacent to the southern edge of Montana Airshed 3B. The three nearest Class I areas are within approximately 62 miles of the project boundaries and are listed in table 36.

Table 36. Federal Class I areas within 62 miles of the Flint Foothills project area

Class I Area	Elevation (feet)	Distance (miles)	Direction
Anaconda-Pintler Wilderness	5,100 – 10,793 (avg.= 7,947)	27	S
Gates of the Mountains Wilderness	3,750 – 7,980 (avg.= 5,865)	35	NE
Scapegoat Wilderness	5,000 – 9,400 (avg.= 7,200)	41	N

The area surrounding the city of Butte is classified by MT-DEQ as a state non-attainment area[29] for PM_{10} (MT-DEQ 2008) and is the only non-attainment area for particulate matter within 100 kilometers of the Flint Foothills project area. The northern boundary of this non-attainment area is approximately 28 miles southeast from the southern-most boundary of the Flint Foothills project area.

Climate

Climate is characterized in terms of precipitation, temperature, and wind regimes. Although the action alternative would not affect the regional climate, aspects of the climate could influence timing or extent of project activities. Precipitation, temperature, or wind extremes can exacerbate the effects of past, present, and future fires. Fire is more common in the summer months where higher temperatures, higher winds, and lower relative humidity result in increased surface evaporation and drier fuels, making densely wooded areas more susceptible to wildfires or human-caused fires. Also, thunderstorm activity in the summer months increases the likelihood of lightning strikes, which can spark wildfires. Higher winds can cause fires to spread further, faster, and with increased intensity.

In Montana, the Continental Divide influences the climate of adjacent areas. West of the Divide, which is where the Flint Foothills project is location, the climate is a modified north Pacific coast type. On the west of the mountain barrier, winters are milder, precipitation is more evenly distributed throughout the year, summers are cooler, and winds are lighter than on the eastern side. The air quality report in the project file displays wind speed data for the Montana 5 airshed. In the west, there is more cloudiness in all seasons, humidity is slightly higher, and the growing season is shorter than in the eastern plains areas.

[29] A community that does not meet or attain the NAAQS may be designated as a non-attainment area by EPA for federal air quality standards or by the state for state air quality standards. The state must then develop an Emissions Control Plan as part of its SIP to improve the air quality and bring the area back into attainment. Management and restriction of prescribed fire emissions may be included in the control plan. The city of Butte has been identified as a Montana PM_{10} non-attainment area (MT-DEQ 2008).

Desired Condition

Forest Plan – Protection of Air Quality

The Forest Plan establishes guidance for all resource management activities on the forest property. The air quality in the vicinity of a fire can be severely impacted from the pollutants within the smoke which is comprised mainly of small particulates. Because smoke is readily transported by the wind, it can also impact air quality at distances downwind of a fire.

With regard to air quality, the Forest Plan has set the following goals, objectives, and standards:

- **Goals:**
  - Air Quality: Air quality is maintained within the standards set by federal and state agencies and by the Montana/Idaho Airshed Group's Memorandum of Agreement and State Implementation Plan.
  - Smoke Management: A variety of management tools (including prescribed fire and appropriate management response) are used to help manage vegetation to reduce potential smoke.
- **Standards:**
  - Standard 1: Meet smoke management requirements according to the Montana/Idaho Airshed Group Operating Guide (MIAG 2008).

Regulatory Framework – Protection of Air Quality

Clean air regulations, laws, policies, and programs that affect the action alternatives are listed below. Additional details are provided in the air quality report in the project file.

- **The Clean Air Act (CAA)** – The U.S. Congress passed the CAA in 1970 and two amendments in 1977 and 1990 (USEPA 1990). The CAA was enacted to protect and improve air quality while ensuring the protection of public health and welfare. It established National Ambient Air Quality Standards (NAAQS) as one measure to define acceptable air quality. The CAA sets the framework under which industries and government agencies, including the Forest Service, are to operate in order to maintain these standards. Each state is given primary responsibility for management of their air quality through State Implementation Plans (SIPs) defined by the entire collection of programs, policies and rules that the state's agencies use to attain and maintain the NAAQS. Through the SIPs, states develop air permitting and air pollution control programs that are as strict, if not more, than those identified in the CAA. The programs address industrial emissions, automobile emissions, outdoor burning, road dust, and similar sources of air pollution. The Montana Department of Environmental Quality (MT-DEQ) is the state agency responsibility for developing and enforcing the SIP. N
- **Non-Attainment Areas –General Conformity Provisions of the CAA** – The general conformity provisions in Section 176(c) of the CAA prohibit federal agencies from taking any action within a non-attainment area (for NAAQS) that causes or contributes to a new violation of the standards, increases the frequency or severity of an existing violation, or delays the timely attainment of a standard. Federal agencies are also required to ensure their actions conform to applicable SIPs. Since the Flint Foothills project is not located within the city of Butte non-attainment area, it is not subject to the general conformity provisions.

In addition to the requirements established under the CAA and Montana's SIP, there are several policies, planning groups, and monitoring programs that must be considered with regard to air quality issues associated with prescribed fires, as follows:

- **Interim Air Quality Policy on Wildland and Prescribed Fires** – The EPA (1998) issued this policy to balance the use of managed wildland fires and prescribed fires with protection of public health and welfare. It has two public policy goals: (1) to allow fire to function in its natural role in maintaining healthy wildland ecosystems, and (2) to protect public health and welfare by mitigating the impacts of air pollutant emissions on air quality and visibility.
- **Montana/Idaho Airshed Group Smoke Management Program** – In 1978, federal, state, and local government agencies, and the forest products industry formed the Montana State Airshed Group for the purpose of managing and limiting the impacts of smoke generated from necessary prescribed burning. Agencies and companies from Idaho joined this group in 1990 and 1999 to collaboratively form the Montana/Idaho Airshed Group. This group operates under a smoke management program to minimize or prevent smoke impacts while using fire to accomplish land management objectives. Airshed Group members coordinate all prescribed burning activities through the Smoke Monitoring Unit (SMU) located in Missoula, Montana. The Departments of Environmental Quality for both Idaho and Montana have certified to the EPA that the Montana/Idaho Airshed Group smoke management program meets EPA's definition of a basic smoke management program. Since the Forest Service is a member of this Airshed Group, all prescribed burning within the Flint Foothills project area will comply with the smoke management program.
- **Airshed Monitoring** – As part of the smoke management program, the Montana/Idaho State Airshed Group has established a smoke monitoring system that provides air quality predictions, air dispersion forecasts, and burn recommendations and restrictions to its members. The Flint Foothills project area is located on the northern edge of Montana Airshed 5 (Upper Clark Fork) and adjacent to the southern edge of Montana Airshed 3B.
- **Smoke Impact Zones** – The MT-DEQ has further defined a number of Smoke Impact Zones around areas that are either not meeting or close to not meeting ambient air quality standards for particulate matter (MT-DEQ, 2008). These impact zones were established so that regulators may monitor open burning activities more closely in and near these areas.

Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Since no prescribed burning activities would be implemented, there would be no effects.

Alternatives 2 and 3

Direct, Indirect and Cumulative Effects

The Clean Air Act and local policies require that Forest Service actions have "no adverse effect" on air resources affecting human populations by not exceeding the NAAQS and not degrading the air quality requirements for Class I areas. Smoke from prescribed fires is unlikely to impact the Butte non-attainment area because the Montana/Idaho Airshed Group would restrict burning during periods when dispersion would transport smoke toward this area.

All prescribed burning activity would be coordinated and conducted through the Montana/Idaho Airshed Group smoke management program to ensure that impacts to air quality would be minimized. This program minimizes impacts to air quality by allowing prescribed burning to occur only during favorable weather, moisture, and air quality conditions. The Montana/Idaho Airshed Group has established an air quality Monitoring Unit that provides daily air quality predictions and restrictions to its members from March 1 to November 30.The practices established by the Airshed Group are considered Best Available Control Technology by the Department of Environmental Quality. The Bureau of Land Management and the Forest Service are permitted to burn based on compliance with burning restrictions set by the Airshed Group and compliance of all other Federal and State laws and regulations.

Compliance with Forest Plan and other Relevant Laws, Regulations, Policies and Plans

All alternatives would be consistent with the Forest Plan and all clean air regulations, laws, policies, and programs identified above.

Transportation

Introduction

This section analyzes the impact of implementing the proposed activities on transportation resources. The analysis area for transportation includes all National Forest System (NFS) lands within the project area, as well as travel routes outside NFS lands that provide access to the project area.

Overview of Issues Addressed

This analysis focuses on the project engineering concerns including road treatments to accomplish proposed vegetation treatments as well as maintenance and reconstruction treatments to improve facilities and reduce negative resource impacts related to the Forest transportation system. Through the public scoping process, the potential for sediment delivery and the spread of invasive plants from temporary road construction was identified as an issue. Road engineering, including new road construction and temporary road construction will be discussed in detail in this analysis.

Measurement Indicators

The measurement indicators used to evaluate impacts of alternatives:

- Work descriptions and mileage summaries for road treatments associated with accomplishing timber treatments, including a breakdown of proposed new road construction and temporary road actions.

Affected Environment

Existing Condition

Transportation Network

The analysis area contains a diverse network of NFS and nonsystem roads and trails. There are currently over 204 miles of existing roads inventoried within the analysis area. While the

majority is managed by the Forest Service as NFS roads, there are also county and private roads as well as unauthorized roads inventoried in the project area (figure 3). There are over 7 miles of NFS trails managed in the project area; additional information on project area trails can be found in the Recreation Resource Report. Table 37 displays the route categories and associated mileage. The current road density within the project area is 2.94 miles/square mile.

Table 37. Existing roads by category in the analysis area

Route Categories	Miles
National Forest System	166.0
County	1.3
Other federal agency	1.5
Private	5.2
Forest Service unauthorized	30.3
Total Roads	**204.3**

There is an additional 26.9 miles of roads outside the project area that provide access from Interstate 90 and Montana State Highway 1 to the Flint Foothills Project area. These routes outside the project area are under various jurisdictions, including Granite County, Powell County, and Forest Service. Figure 3 in chapter 2 displays existing roads accessing the Flint Foothills project area.

Access to the Project Area

Public road access to the southwest portion of the project area is the Finley Basin Road (Forest Road 676). This road is managed jointly by the Granite County and the Forest Service. The road starts at State Highway 1 with a paved surface (near Maxville), which then transitions to aggregate surface and then native surface before intersecting with NFS Road 1500. This Eureka Ridge Road (NFS Road 1500) climbs and accesses the SW portion of the project area.

The west side of the project area is accessed by two roads that connect with State Highway 1: the Gird Creek Road (NFS Road 8402) and the Granite County managed Douglas Creek Road. The Gird Creek Road, aggregate-surfaced from Hwy 1 and transitioning to native-surfaced after 1.6 miles, accesses the western-most project area and also connects with Forest Road 8454 (East Gird Creek). Aggregate-surfaced Forest Road 8454 passes through private land and jurisdiction for 1.7 miles before entering NFS lands and becoming native-surfaced NFS Road 8454.

The northeast portion of the project area is accessed via the Gold Creek drainage from Interstate 90. Powell County managed and aggregate-surfaced Gold Creek and Mullan Trail Roads provide access to Forest Road 636 (also Gold Creek), which is also managed by Powell County for the first 2.5 miles. Native-surfaced Forest Road 636 enters the project area and provides access to NFS Road 1557 (Jackson Park Road), which accesses a network of roads in the northern portion of the project. Forest Road 636 transitions to Forest Service jurisdiction and becomes NFS Road 636, which accesses the eastern and southern portions of the project area. Figure 3 in chapter 2 indicates the haul routes outside of the project area, and figure 5 and figure 7 in chapter 2 displays haul routes proposed by alternatives 2 and 3 respectively.

The BDNF North Visitor Map (2010) and the BDNF Addendum to Travel Route Restrictions-North Map are available through the USFS and provide additional information for roads and trails.

Flood Damage

Due to high precipitation and runoff in the winter of 2010-2011and the following spring, there are a number of flood damage sites that currently affect access to the project area. Five sites located on project roads include: Upper and Lower Douglas Creek washouts (both on NFS Road 707), lower Gird Creek (NFS Road 8402), Upper Gird Creek (NFS Road 666), and a fill failure or slump on NFS Road 1544. These sites have resulted in public road closures and blocked access to some portions of the project area. The Forest Service is currently working on repair plans to the Upper and Lower Douglas Creek washouts (NFS road 707), and lower Gird Creek (NFS road 8402), outside of the Flint Foothills project.

Desired Condition

Forest Plan

The following direction and desired condition components (forestwide desired condition, goals, objectives, and standards) come from the Beaverhead-Deerlodge Forest Plan (USDA Forest Service 2009a).

Desired forestwide conditions include:

- People and communities benefit from programs and infrastructure that support livestock grazing and an array of forest products and services. Methods for using resources to benefit people while maintaining functioning ecosystems are employed.
- Visitors benefit from a range of primitive to developed recreation settings and opportunities. Most of the BDNF continues to offer uncrowded motorized and nonmotorized backcountry opportunities, and
- Resources adversely affected by past management activities have been rehabilitated or the related public health and safety issues corrected.

Goals of the Forest Plan for infrastructure include:

- The minimum transportation system necessary is identified and managed.
- Roads and trails are identified in the transportation atlas maintained at the Forest Supervisor’s Office.
- Roads and trails are constructed, managed, and maintained to meet land and resource objectives.

Goals of the Forest Plan for recreation and travel management include:

- A system of routes and areas designated for nonmotorized and motorized use are identified and available for public use.

Standards of the Forest Plan for recreation and travel management include:

- Permanent road construction is not allowed in summer nonmotorized allocations or in areas evaluated for wilderness potential.

- Motorized vehicles are not allowed in summer or winter nonmotorized allocations except for permitted or administrative use.
- Restrict year-round, wheeled motorized travel to designated routes or areas

Other Direction

The Pintler Ranger District also completed a preliminary transportation (travel) analysis in 2008, which included the Flint Foothills project area (USDA Forest Service 2008). This analysis assessed inventoried routes within the analysis area based on resource risks and values. Ultimately, changes to current travel management direction were recommended to better manage the Forest transportation system. These recommended changes were site specific, route by route, and included: Adding routes to the Forest transportation system, decommissioning unneeded routes, closing and storing roads for future use, converting roads to trails, and mitigating resource concerns through road maintenance and reconstruction. Relevant components of the 2008 analysis that affect road use for the Flint Foothills project have been incorporated into the analysis.

Last of all, road management activities in accordance with Best Management Practices (BMPs) are a preferred way to protect water quality (Logan 2001).

Environmental Consequences

Methodology

Transportation in the project area is largely road dependent. Therefore, methods to assess impacts of the alternatives on transportation resources in the project area involved analysis of impacts to these facilities. Forest Service Geographic Information System (GIS) data were used to compute indicators such as miles of existing, new and temporary roads to be used as haul routes, and miles of road decommissioning. In addition, field data from engineering road condition surveys were used to identify the conditions of roads within the project area, as well as to prescribe work items and estimate costs. The overall effect of road changes on transportation in the project area is also qualitatively discussed.

Assumptions and Limitations

The GIS data used to compute mileages generally do not correspond precisely (to the nearest hundredth of a mile) with the engineering surveys, which utilized vehicle-measured mileages for field reports. However, intersections and other landmarks were adequately noted in the field data, which allowed for confident spatial analysis involving particular route segments.

Incomplete and Unavailable Information

The best available information was used to analyze impacts to transportation resources for the effects analysis. However, some information was incomplete and unavailable due to the ongoing planning of timber activities. Approximately 80 percent of the proposed project roads received engineering surveys, and this data was used to extrapolate work and costs for the other 20 percent. In addition, within the timber treatment units, harvest activities and associated roadwork would be expected to be completed within 5 years following initiation of contracts. However, the exact dates, sequence and schedule of timber operations is unknown at this time.

Spatial and Temporal Context for Effects Analysis

The spatial scale of the impact analysis is the project area plus the inventoried travel corridors connecting the project area with Interstate 90 and State Highway 1. The short-term timeframe used for this analysis is 0 to 10 years and the long-term effects are those that last beyond 10 years. The short-term period was selected to cover harvest activities. It is anticipated that the effects of the proposed project would be visible from 1 to 40 years, depending on the extent and visibility of the proposed treatments and the details of the actual project implementation.

Connected Actions, Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

Historic and ongoing land use activities continue to affect the project area and have the potential to affect the cumulative effects analysis for transportation resources.

Past and Present Actions

A number of past and present actions have occurred or are occurring in the assessment area that affect transportation resources including: mining, livestock grazing, noxious weed control, use and maintenance of forest roads and trails, firewood cutting, timber harvest, wildfire and fire management and suppression activities and other land management decisions.

Timber harvest has been a relatively common occurrence within the project area. With the high mortality from the mountain pine beetle, additional danger (hazard) tree removal has been and continues to occur along roads and in developed recreation sites.

Danger tree removal within the project is being conducted in accordance with the Decision Memo for Forest-Wide Developed Site Hazard Tree Removal within the BDNF (USDA Forest Service 2009c).

Reasonably Foreseeable Future Activities

Table 24 at the beginning of chapter 3 discloses the present and reasonably foreseeable actions within the project area that are relevant to this DEIS analysis. Reasonably foreseeable future activities that have the potential for effects to transportation resources are generally the same as the past and present actions discussed above and include mining, livestock grazing, noxious weed control, wildfire, fire suppression activities, and additional road and trail use, maintenance, construction and restoration.

Continued danger tree removal along roads and at developed sites is a likely foreseeable activity as trees continue to be stressed and die.

Flood damage repairs to locations on NFS Road 707 (2 sites), and 8402 (discussed in the existing condition section) is anticipated in the next 3 years.

Stream rehabilitation is being planned for the Douglas Creek watershed, including replacement of six stream crossings as well as reconstruction of 400 feet of stream adjacent to NFS Road 707.

Another planned activity will be the Motor Vehicle Use Mapping (MVUM) effort as part of the travel planning and motor vehicle route and area designation process.

Alternative 1 – No Action

Direct and Indirect Effects

There would be no direct or indirect effects to the transportation system from the Flint Foothills Project because no project activities are proposed.

Dead and dying trees impacted from the mountain pine beetle would remain and continue to fall and break, creating potential safety issues as people travel and recreate in the area. Basic annual road maintenance would continue, although likely at a less efficient rate due to dead and dying trees that continue to fall across routes, potentially blocking access. Transportation efficiency to and through the project area would likely decrease.

Road drainage improvements associated with vegetation treatment access and product removal in compliance with BMPs would not occur in the project area.

There would be no change in the number of miles of open roads.

Cumulative Effects

Danger tree management (hazard tree removal) has occurred in the past and may continue in the future both along roads and in developed recreation sites, but comprehensive vegetation management would not occur and merchantable timber would not be salvaged. Basic annual maintenance of roads and trails would continue as funding allows. Many of these routes currently receive little maintenance, due to limited funds and backlogged maintenance. This trend would likely continue and impact future use.

Completion of the flood damage repairs for roadway failure locations on NFS Roads 1544, 666, 707 (two sites), and 8402; and the Douglas Creek stream crossing replacements and associated stream reconstruction would provide site-specific improvements to the transportation system.

Under this alternative there would be a potential threat to transportation infrastructure over time from tree blow downs, though danger tree management could occur under smaller, separate project plans and decisions.

Under this alternative, while storm damage road repairs and previously planned projects in Douglas Creek would occur, overall the project area would not move towards the desired future condition described in the Forest Plan (USDA Forest Service 2009a, pages 11-62). The anticipated Route and Area Designation Process and production of a motor vehicle use map (MVUM) for the area would still occur.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Under alternative 2 both existing roads and newly constructed roads--- temporary and permanent system roads-- would be used to transport logs and forest products from the treatment units to main arterial roads (State Highway 1 and Interstate 90) outside the USFS boundary. Figure 5 in chapter 2 shows the location of alternative 2 proposed transportation activities. A complete list of route segments and associated actions by alternative is included in appendix B of the Transportation Report in the project file.

Road maintenance and reconstruction activities on existing roads would bring the roads to a standard complying with BMPs and also allow for safe product removal. Just over 1 mile of unauthorized roads would be added to the Forest transportation system following reconstruction, and would be managed as maintenance level 2 roads (high clearance vehicles recommended). After vegetation treatments, 4.4 miles of other reconstructed existing temporary roads (unauthorized routes) would be decommissioned; these treatments are further outlined in table 6. A 0.6-mile reduction of roads open to motor vehicle use would result in the project area following treatments, and a total reduction of 3.1 miles of road would occur.

Nearly 1.3 miles of new road would be added to the Forest transportation system as NFS road, and would be put into storage (maintenance level 1) for future access following implementation of the Flint Foothills project. These maintenance level 1 roads would be closed to motor vehicle use during the time they are in storage. The 7.2 miles of newly constructed temporary road would be decommissioned by obliteration following implementation.

The new temporary roads, in particular temporary road T3 (due to proximity to an ephemeral draw in unit 55C), would be constructed away from the bottom of channels to avoid sedimentation. Where feasible, the roads would be constructed at least 50 feet from the bottom of draws, and a culvert or other means for stream crossing would be provided for areas where it is necessary to cross the draws. Natural vegetation filters or slash filter windrows, or suitable alternatives, would be utilized where the roadway drainage is directed towards the draws.

Implementing the associated transportation actions in this project would bring management of the Forest transportation system closer to the identified minimum system identified in the Pintler travel analysis. Road maintenance and reconstruction associated with timber haul, in addition to the removal of dead and dying trees, would provide for much needed maintenance and also a safer and more efficient transportation system, allowing for additional mileage to be maintained with future annual maintenance funds. NFS haul routes would be improved to comply with BMPs.

The road density within the project area after project implementation would be 2.89 miles/square mile.

Timber harvesting and associated transportation activities would be expected to occur within 5 years from the start of the timber contract(s).

Road use authorizations would need to be obtained for Forest Service, or Forest Service contractor, use of private routes. Use and maintenance should also be coordinated with the Powell and Granite County Public Works Departments for public county roads used to implement the timber and restoration treatments.

Appendix C of the Transportation Report in the project file provides a breakdown of road work items and estimated costs by alternative.

Cumulative Effects

Alternative 2 would contribute to cumulative effects to the transportation system by constructing, reconstructing, maintaining, and decommissioning roads within the project area.

Flood damage to roadway failure locations on NFS Road 707 (2 sites), and 8402 is anticipated in the next 3 years.

In the Douglas Creek Watershed, six stream crossings would be replaced, as well as reconstruction of 400 feet of stream adjacent to NFS Road 707.

The Route and Area Designation Process and production of a motor vehicle use map (MVUM) for the area would also occur. Travel management direction changes would require additional analysis and decision making prior to designation.

Collectively, the Forest transportation system within the Flint Foothills Project area would be in better condition: more resilient to storms and runoff, further maintained in accordance with Best Management Practices, and with closer resemblance to the minimum road system identified in the Pintler Ranger District travel analysis.

Alternative 3

Direct and Indirect Effects

Under alternative 3 only existing roads, including NFS and unauthorized routes would be used to transport logs and forest products from the removal treatment units to main arterial roads (State Highway 1 and Interstate 90) outside the USFS boundary. Figure 7 in chapter 2 shows the location of alternative 3 proposed transportation routes. A complete list of route segments and associated actions by alternative is included in appendix B of the Transportation Report in the project file.

Road maintenance and reconstruction activities on existing roads would bring the roads to a standard complying with BMPs and also allowing for safe product removal. Just over 1 mile of open unauthorized roads would be added to the Forest transportation system following reconstruction, and would be managed as maintenance level 2 roads (high clearance vehicles recommended). After vegetation treatments, 2.3 miles of other reconstructed existing temporary roads (unauthorized routes) would be decommissioned; these treatments are further outlined in table 6. There would be a total reduction of 2.3 miles of road (unauthorized routes) in the project area following treatments. There would be a negligible change (less than 200 feet) in mileage available for motor vehicles,

Road use authorizations would be the same as for alternative 2.

Implementing the associated transportation actions in this project would bring management of the Forest transportation system closer to the identified minimum system identified in the Pintler travel analysis. Road maintenance and reconstruction associated with timber haul, in addition to the removal of dead and dying trees, would provide for much needed maintenance and also a safer and more efficient transportation system, allowing for additional mileage to be maintained with future annual maintenance funds. NFS haul routes would be improved to comply with BMPs.

The road density within the project area after project implementation would be 2.90 miles/square mile.

Appendix C of the Transportation Report in the project file provides a breakdown of road work items and estimated costs by alternative

Cumulative Effects

Alternative 3 would contribute to cumulative effects to the transportation system by reconstructing, maintaining, and decommissioning roads within the project area.

Flood damage repairs to roadway failure locations on NFS Road 707 (2 sites), and 8402 is anticipated in the next 3 years.

In the Douglas Creek Watershed, six stream crossings would be replaced, as well as reconstruction of 400 feet of stream adjacent to NFS Road 707.

The Route and Area Designation Process and production of a MVUM for the area would also occur. Travel management direction changes subsequent to the FFVMP decision would require additional analysis and decision making prior to designation.

Collectively, the Forest transportation system within the Flint Foothills Project area would be in better condition: more resilient to storms and runoff, further maintained in accordance with Best Management Practices, and with closer resemblance to the minimum road system identified in the Pintler Ranger District travel analysis.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The no-action alternative would be consistent with the Forest Plan for infrastructure, although no action would be taken to achieve the desired conditions. Alternatives 2 and 3 would be consistent with the Forest Plan (USDA Forest Service 2009a) desired conditions, goals, objectives and standards for transportation management. Alternatives 2 and 3 activities would include implementing and managing recommendations included in the Pintler travel analysis (USDA Forest Service, 2008) and moving the Forest transportation system closer to the identified minimum system. Transportation actions in the action alternatives are also in accordance with regulations and policies regarding transportation and travel management.

The Forest Plan (USDA Forest Service 2009a) complies with the National Forest Management Act of 1976 (NFMA); the regulations for the National Forest Land and Resource Management Planning (36 CFR Part 291); and the National Environmental Policy Act (NEPA) of 1969.

Sensitive Plants

Introduction

This document serves as the biological evaluation of impacts to USDA Forest Service Northern Region sensitive plant species, including federally listed species. It is Forest Service policy to protect the habitat of federally listed threatened and endangered species (FSM 2670.31), and to avoid or minimize adverse impacts to species designated by the Forest Service as sensitive (FSM 2670.32).

In order to determine impacts, all Forest Service projects, programs, and activities are reviewed for possible effects to federally listed, threatened or endangered plant species and Forest Service designated sensitive species. No federally listed threatened or endangered plants are known to occur on the Beaverhead-Deerlodge National Forest. Therefore, the following analysis will address only the potential impacts to Forest Service designated sensitive plant species and their habitats as a result of implementing the proposed Flint Foothills Vegetation Management Project.

Overview of Issues Addressed

Sensitive plant populations and habitats can be impacted by vegetation management projects. Direct impacts can include disturbance of sensitive plant habitat from project activities and equipment, as well as direct removal or death of individual plants. Indirect impacts that may decrease sensitive plant viability can include the spread of invasive weeds and/or increased livestock grazing as a result of reduced overstory vegetation. Indirect impacts that may increase sensitive plant viability can include reduced competition from conifers or overstory species, as well as habitat creation for sensitive plant species adapted to disturbance.

Actions within the proposed activity areas may harm or destroy sensitive plants or negatively affect their habitat if present. Ground disturbing activities, prescribed fire and increased traffic related to the proposed activities may affect sensitive plants and their habitat, landscape community health, and biodiversity.

The purpose of this analysis is to:

- Determine if the alternatives will adversely affect any of the sensitive plant species that have potential to occur in the project area;
- Insure that the alternatives do not contribute to the loss of viability of any sensitive plant species or cause a trend toward federal listing;
- Comply with USDA Forest Service Region 1 policy to insure that sensitive plant species receive full consideration in the decision-making process;
- Comply with the Endangered Species Act.

Measurement Indicators

The measurement indicators used to evaluate impacts of alternatives:

Presence of sensitive plants or potential habitat in the area of analysis would indicate that impacts from the proposed action should be considered. The threshold determination is whether the proposed action has the potential for loss of viability of sensitive plants or suitable habitat.

Affected Environment

Existing Condition

The Flint Foothills project area is experiencing extensive tree mortality in lodgepole pine, Douglas fir and ponderosa pine due to the ongoing insect and disease epidemic. Dense conifer stands do not typically present habitat for BDNF sensitive plant species. However, moist seeps, streams, ponds, bogs, open meadows, sparsely vegetated slopes, disturbed sites and some road-cut situations can present habitat for BDNF sensitive plant species.

The following nine species were identified as having potential habitat within the project area: Austin's knotweed (*Polygonum douglasii* ssp. *austiniae*), California false-hellebore (*Veratrum californicum*), Hall's rush (*Juncus hallii*), Lemhi penstemon (*Penstemon lemhiensis*), Missoula phlox (*Phlox kelseyi* var. *missoulensis*), peculiar moonwort (*Botrychium paradoxum*), Sapphire rockcress (*Arabis fecunda*) wavy moonwort (*Botrychium crenulatum*), and western moonwort (*Botrychium hesperium*). These nine species were surveyed for in the Flint Foothills project area.

In July 2011, the U.S. Fish and Wildlife Service (USFWS) declared whitebark pine (*Pinus albicaulis*) a warranted but precluded species for federal listing, giving it candidate status for the time being. The

Northern Region of the USDA Forest Service has designated whitebark pine a sensitive species based on the USFWS candidate status. Whitebark pine is known to occur within the project area at mid- and high elevations, but was not specifically surveyed during the sensitive plant surveys for the Flint Foothills Project.

Hall's rush, Lemhi penstemon and sapphire rockcress were all identified as having potential habitat within the project area. However, no populations of these species were found and none are known to occur on the Pintler Ranger District where the Flint Foothills project is occurring. Because the project area is likely outside of their range, they will not be carried forward for analysis.

Austin's knotweed, Missoula phlox and California false-hellebore all had potential habitat within the project area. Known populations occur on the Pintler Ranger District. These species will be carried forward for analysis.

Austin's knotweed – Austin's knotweed is a sparsely distributed species in Montana, occurring in open, gravelly, and sparsely vegetated slopes with shale-derived soils. There are roughly 30 known occurrences in Montana, most of which are generally not impacted by human activity due to habitat, though some do occur along roads (Austin's knotweed 2012). Populations do occur on the Pintler Ranger District, but are not known to occur within the project area, and were not found during project surveys. Steep shale slopes are present within the project area, but are not common.

California false-hellebore – California false hellebore is rare in Montana where it occurs at the periphery of its range in the southwestern corner of the state on the BDNF. Less than five occurrences are known in the state. Its habitat includes wet meadows and streambanks (Californian false-hellebore 2012). Populations occur on the Pintler and Wisdom Ranger Districts. No populations were found during project surveys, but potential habitat was present.

Missoula phlox – Missoula phlox is a state endemic, known from over two dozen occurrences in Montana. It occurs in the foothills on open, exposed slopes of limestone derived material, and in the subalpine zone on exposed ridges (Missoula phlox 2012). Several locations occur on the Pintler Ranger District. No populations were found during project surveys, but potential habitat was present.

Moonworts – One population of wavy moonwort was found during project surveys, occurring along an old, abandoned, logging road between proposed units 32ST and 33C. Aside from this population and the known whitebark pine, no other sensitive plant populations are mapped within the project area or were found during surveys.

Moonworts are difficult species to detect in the field due to their small size, sparse distribution, irregular appearance, and variation in timing of appearance. Once found the identification can be very challenging, as species differentiation is based on subtle distinctions in appearance that are only apparent in mature individuals. Even when mature, discrepancy in identification between botanists exists (Vanderhorst 1997). Potential habitat for both peculiar moonwort and western moonwort was found within the project area, and known populations occur on the Pintler Ranger District. Therefore, based on these findings, it is likely that populations of peculiar and western moonwort do occur within the project area, and were missed during project surveys. For this analysis, they will be treated as if present, but undetected.

Wavy moonwort – Wavy moonwort is a sparsely distributed sensitive plant known from over 40 populations in Montana. Additional populations occur in Arizona, California, Idaho, Oregon, Nevada, Utah, Washington, and Wyoming, as well as in Alberta and British Columbia, Canada (Wavy moonwort 2012). Previous to project surveys, there were several known locations of wavy moonwort

on the Pintler Ranger District of the BDNF, most within 5 miles of each other, as well as one unconfirmed location on the Wise River District (Salix, personal observation 2012). Within the project area, one new population of wavy moonwort was found during project surveys, occurring along an abandoned logging road bisecting proposed treatment units 32ST and 33C.

Currently, wavy moonwort has a global rank of 2 (G2), which means imperiled due to rarity or with very restricted range, i.e., vulnerable to extinction. Trend monitoring of all G1, G2, and G3 sensitive plant species is required per Forest Plan Direction (2009). Monitoring results will be reported in the 2014 BDNF Monitoring Report.

Moonworts are an interesting group of perennial plants, closely related to ferns with much of their life being spent underground as immature plants, and reproducing via spores. After germinating underground, plants may not emerge above ground for 5-10 years. When they do emerge, they produce only one leaf, and stand only 1-10 cm tall (BDNF sensitive species) making them very difficult to detect. Above ground emergence is very sporadic, where after emerging one year, they may not return above ground for several years. Yearly fluctuations in population numbers vary greatly between years because of this, likely due to environmental and demographic factors (Ahlenslager and Potash 2007). Time of year for emergence fluctuates yearly as well (Vanderhorst 1997).

Research indicates that most moonworts require habitats that have experienced some level of past disturbance, 10-30 years previously (both natural and anthropogenic), and are therefore found in early to mid-successional habitats (Ahlenslager and Potash 2007). Moonworts are heavily dependent on fungi, or mycorrhizal associations, for carbohydrates, minerals, and water uptake (ibid). Their dependence on a fungal relationship is a possible explanation for their delayed inhabitance, as fungal species composition and abundance change with succession. Successful establishment of moonwort species may be delayed until suitable mycorrhizal symbionts are present (Anderson and Cariveau 2004).

Identification of moonworts to the species level is very difficult, and many populations in Montana are simply mapped as *Botrychiums*, without identification to the species level. In addition to the difficulties in detecting them in the field and proper species identification, there are taxonomic questions that have yet to be resolved among the moonwort experts (USDA Forest Service 2000 - Marriot).

The population of wavy moonwort found along the abandoned logging road contained roughly 15 to 30 individuals within a half-acre area. The site is located on the north side of a draw, with Douglas-fir saplings encroaching into the road prism. The site was noticeably shadier than other wavy moonwort sites observed by the botanist. Wavy moonwort is commonly found occupying roadsides, meadows, wet swales, and edges of marshes or other open disturbed sites. With continued succession towards a dense, closed-canopy forest, moonwort populations are known to decline (Ahlenslager and Potash 2007). With the current site conditions, it is anticipated that continued encroachment and shading by conifers will reduce the viability of the population and will likely lead to a reduction or loss of the population over time (Mincemoyer 2012).

Peculiar moonwort – Peculiar moonwort is a sparsely distributed species, being irregularly distributed in the west in Canada, Oregon, Utah and Washington (Peculiar moonwort 2012). Over 24 populations are known in Montana. It is associated with wet meadows of spruce and lodgepole pine forests, but is also known to occur along roadsides on the BDNF. Life history and ecology is similar to that described above for wavy moonwort.

The inconspicuous nature of peculiar moonwort and moonworts in general make it very difficult to detect during project surveys, as mentioned previously. As there are known populations on the district as well as large areas of suitable habitat found within the project area, and a presence of a wavy moonwort population within the project area. This makes a strong case for there being peculiar moonwort in the project area. Therefore, peculiar moonwort will be analyzed as if known occurrences are within the project area.

Western moonwort – Western moonwort is a sparsely distributed species across its range where it occurs in eastern and western North America. In the Rocky Mountains it extends from Arizona north into Alberta and Saskatchewan. Roughly 30 populations are known in Montana (Western moonwort 2012). On the BDNF, it is only known to occur on the Pintler Ranger District. Life history and ecology is similar to that described above for wavy moonwort.

As with peculiar moonwort, the difficulty in detecting individuals, the amount of suitable habitat, and the presence of wavy moonwort all make a strong case for not discounting western moonworts occurrence in the project area. Therefore, western moonwort will be analyzed as if known occurrences are within the project area.

Whitebark pine – Whitebark pine is a common conifer of subalpine forests and can be a dominant species of treeline and Krummhotz habitats (Whitebark pine 2012). It can also occur in mid-elevation mixed-conifer stands.

Project-specific surveys were completed for whitebark pine within the Flint Foothills Project area, and identified approximately 683 acres of whitebark pine, located in whitebark pine dominated stands or mixed-conifer stands with whitebark present (Vegetation section). Many of the mature whitebark pine trees observed within the project area have been moderately to severely impact by a combination of blister rust (*Cronartiam ribicola*) and mountain pine beetles (*Dendroctonus ponderosae*). Forestwide monitoring has shown a substantial amount of whitebark pine regeneration established under more pure whitebark pine stands, and mature whitebark pine trees persisting in the face of both beetle and blister rust pressure (USDA 2011). This establishment of whitebark pine seedlings underneath dead whitebark mature trees has been observed in the project area. Whitebark pine occurs most commonly at the highest elevations in the project area, with a few scattered individuals or in smaller (0.25-acre) patches down to the mid-elevations (Vegetation section). Stand exams identified whitebark pine within three mid-elevation burn units 3B, 4B and 5B.

Whitebark pine functions as a keystone species because of its various roles in supporting community diversity, and as a foundation species for its roles in promoting community development and stability. These roles include: providing snow capture and retention; carbon storage; increasing biodiversity; and serving as a good food source for wildlife. Conifer encroachment into whitebark pine habitat, resulting from extensive mortality due to exotic white pine blister rust, the native mountain pine beetle infestation, and wildfire exclusion is occurring range wide (Vegetation section). Warming temperatures are thought to further increase the rate of mortality due to favorable conditions for white pine blister rust and mountain pine beetle (Greater Yellowstone Coordinating Committee Whitebark Pine Subcommittee 2011). Several agencies are planning and implementing protection and restoration efforts within whitebark pine stands across its range. Some of these include: protecting apparently rust-resistant trees and seed cones; planting rust-resistant trees back into the communities; reducing fuels and canopy cover around whitebark pine stands; and incorporating fire management into whitebark pine stand protection (Greater Yellowstone Coordinating Committee Whitebark Pine Subcommittee 2011).

Monitoring whitebark pine stands on the Beaverhead-Deerlodge National Forest began in 2010 and is planned to expand and continue on the Forest. Nine plots were established across the Forest and data collected included: number of seedlings, number of live trees over 4.5 feet tall, number of dead trees over 4.5 feet tall, percent live with blister rust, percent live with mountain pine beetle infection, and percent live without either blister rust or mountain pine beetle. The initial data collected showed the majority of trees at the nine monitoring plots in the seedling stage (49 percent) representing good regeneration, and 73 percent were live without mountain pine beetle or blister rust infestation (Vegetation section).

Desired Condition

The desired condition is derived from laws and FS policy. The National Forest Management Act (NFMA) of 1976 directs the FS to provide for diversity of plant and animal communities. Forest Service direction (FSM 2672.1-2672.43) requires programs or activities be reviewed for potential effects on sensitive species and outlines policy, objectives, and procedures to ensure that species do not become threatened or endangered as a result of FS actions.

The desired condition as it pertains to sensitive plants is stated in the Forest Plan, and directs the Beaverhead-Deerlodge National Forest to maintain and restore sensitive plant populations and their habitat. Large core populations or fringe-of-range populations of sensitive plants are to be conserved in research natural areas, botanical special interest areas, or protected as populations in conservation strategies or project design specifications (USDA Forest Service 2009 p, 43).

Environmental Consequences

Methodology

A pre-field review of the Beaverhead-Deerlodge NF Sensitive Plants Program files, GIS resources (USDA Forest Service 2010c), and the Montana Natural Heritage database (MNHP 2009-2011) was conducted to identify any known populations of sensitive plants within the project area, and to determine potential habitats (A list of all sensitive plants on the BDNF, which identifies presence of populations and suitable habitat, is included in appendix B of the sensitive plant report in the project file). Prior to project-specific surveys, no known sensitive plant populations or protected, managed habitats were known to occur within the project area. Proposed units containing potential habitat for sensitive plants were identified through this pre-field review and selected for field survey.

During 2010 and 2011 field seasons, a total of 55 units were surveyed, as well as ten miles of roads, covering 3,339 acres, or 59 percent of the total proposed acres and miles in the proposed action (acres of each unit and miles of each road surveyed are in appendix A of the sensitive plant report in the project file). Botanical surveys consisted of the intuitive–controlled survey method. Two survey periods were completed in 2010, one in June targeting the early-blooming species and one in August targeting the late-blooming sensitive plant species. In 2011, only August and September surveys were conducted.

As stated previously, wavy moonwort was found along an abandoned logging road intended for use during project activities, and whitebark pine is known to occur in approximately 683 acres across the project area. Peculiar moonwort and western moonwort are also likely to occur within the project area.

Incomplete and Unavailable Information

A concerted effort was made to identify potential sensitive plant habitats using GIS, satellite imagery, field visits and local knowledge. Surveys were scheduled to overlap with sensitive plant flowering windows as much as possible. However, there is always a low possibility of an individual or small population going undetected during surveys.

This Biological Evaluation was prepared based on presently available information. If the action is modified in a manner that causes effects not considered, or if new information becomes available that reveals that the action may impact sensitive plants in a manner or to an extent not previously considered, a new or revised Biological Evaluation may be required.

Spatial and Temporal Context for Effects Analysis

The spatial boundary for the sensitive plants analysis is the National Forest System lands within the project area boundary. A specific emphasis will be placed on activity areas where vegetation treatment and road construction are proposed. The spatial scale is limited to the project area since no impacts to sensitive plants are anticipated outside the project area boundary.

The temporal timeframe covers the immediate effects at the time of implementation and extends into the future 50 years. The temporal scale is based on the progression period of sensitive plant habitats being encroached by conifers, the period required for sensitive plants to colonize new disturbances (Ahlenslager and Potash 2007), and the time used by the Vegetation Report.

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Table 24 at the beginning of chapter 3 discloses the present and reasonably foreseeable actions within the project area that are relevant to this DEIS analysis. Past and present actions that affect sensitive plant habitats include fire suppression, timber harvest, roadside hazard tree removal, prescribed burning, livestock grazing, invasive plants control, recreation activities, and storm and damaged road and culvert repair. These actions have contributed to the existing vegetation and habitat conditions and will likely continue into the future, and will be considered in the cumulative effects analysis.

Alternative 1 – No Action

Direct and Indirect Effects

Since no activities are proposed in alternative 1, there would be no direct effects.

The no-action alternative provides a means for evaluating the current ecosystem conditions as a baseline. The no-action alternative would result in the continued mortality of dense Douglas-fir and lodgepole pine stands as a result of insect and disease.

The lack of vegetation treatments would allow conifer and other herbaceous species to increase in density and canopy layering (Vegetation section). The impacts to sensitive plants could include fuel loading and increased fire severity, changed habitat conditions and competition. All of these forces may take decades to incur impacts to sensitive plant populations and their potential habitats.

Sensitive Moonworts - Wavy moonwort would continue to occur along the abandoned logging road for some time. Moonwort species habitats are known to be ephemeral (Zika et al. 1995). The continued trend of conifer encroachment into wavy moonworts habitat would likely reduce the viability of the current population by over-shading and lead to an eventual loss of the population

(Mincemoyer 2012), potentially within 50 years, pending the lack of a natural disturbance such as fire. This loss is unrelated to project activities, but a natural progression of the disturbed site.

Zika (1995) states that a number of moonwort habitats were historically maintained by fire; fire suppression has led to vegetative succession and fuel loading, which has reduced habitat. Zika presumes that moonworts must either withstand some degree of fire or readily recolonize burned areas from adjacent populations. Under the no-action alternative, no prescribed burning would occur, allowing vegetation conditions to exist in their current state or progress into a later- seral condition.

Western moonwort and peculiar moonwort, if present, would experience the same impacts from conifer encroachment as those described above.

Whitebark Pine - Whitebark pine would continue to be impacted by blister rust, mountain pine beetle, and fire suppression (Keane and Parsons 2010). Impacts to whitebark pine as a result of the no-action alternative would include the continued decline from these factors, as well as continued conifer competition into whitebark pine populations (Vegetation section).

Austin's knotweed, Missoula phlox and California false-hellebore - These species all prefer open habitats. Under the no-action alternative conifer encroachment could compromise the potential for Austin's knotweed, Missoula phlox and California false-hellebore to occupy these habitats. Assuming that sensitive plants would occupy these open habitats in the future is entirely speculation and cannot be known for several years or decades.

Cumulative Impacts

Under the no-action alternative, the following activities could continue to impact sensitive plant populations: Roadside #4 Hazard Tree Removal, timber harvest, livestock grazing, recreational activities (hiking, OHV, hunting, etc.), invasive plant control, wildfire suppression, prescribed burning, and the storm damaged road and culvert repairs.

Moonworts - Timber harvest occurred previously in the units where wavy moonwort was identified along the abandoned logging road. This previous disturbance likely made the habitat suitable for wavy moonwort and other moonworts to occupy. Natural and man-made disturbances, including fire, are known to create potential moonwort habitats (Zika et al. 1995). Several sensitive moonwort populations on the forest occur along roadsides. The Roadside 4 Hazard Tree Removal project occurring partially within the project area intersects with a couple of these known locations. Project activities in these known locations are being buffered to protect individuals. Additional habitat will likely be created by the Roadside 4 Hazard Tree Removal project, as it will open up the canopy creating an early successional, disturbed habitat that is favorable to moonwort species.

Livestock grazing occurs within the project area, and includes the area where wavy moonwort is present (the Hall Allotment). Livestock can impact moonwort species directly by grazing above ground structures, removing reproductive structures, and by trampling (Beatty et al. 2003). Indirectly, livestock can impact moonwort habitat by compacting soils, facilitating the spread of weeds and by changing the plant community (ibid). Currently, the population of moonwort found within the project area shows no signs of being impacted by grazing.

Recreation activities within the project area could occur within the wavy moonwort population area. With the Douglas Cabin located nearby, hiking, horseback riding and hunting within the area could occur. These activities in the area occur at low to moderate rates and should have little impact on the population.

Invasive plant species can have long-term impacts on sensitive plant species. Invasive plants can make occupied and potential habitats unsuitable for sensitive plant species. Control of invasive plants through various means can benefit sensitive plants by reducing invasive plant species from their habitats. However, control methods, such as broadcast spraying, can cause short-term harm to sensitive plants if they come into contact with the chemical (USDA Forest Service 2000-Ode). The Beaverhead-Deerlodge Weed Management Plan (2002) protects sensitive plants by employing the following mitigation measure:

> "No herbicide will be applied directly on sensitive plants during spot applications and a 100-foot buffer will be employed around known populations of sensitive plants during broadcast applications (including aerial). All aerial treatment areas will be surveyed for sensitive plants prior to initial spraying."

Invasive plants control activities do occur within the project area, but not within the immediate vicinity of the known wavy moonwort population, as no invasive plants were identified as currently present. Invasive plants control activities within the project area are not known to be impacting sensitive plants at this time.

Fire suppression can impact sensitive moonwort species by allowing conifer encroachment to alter their existing and potential habitats (Beatty et al. 2003), making it too shady for their existence.

Prescribed burning in the past, likely created potential habitat for sensitive moonwort species by reducing canopy cover.

Storm-damaged roads and culvert replacement activities proposed in the project area could impact sensitive moonwort populations if they occur along these routes or adjacent to the culvert footprint.

Overall, short-term cumulative impacts to sensitive moonwort species would be minimal. Fire suppression and the resulting conifer encroachment and successional changes over the next 50 years could have moderate impacts on existing sensitive moonwort populations within the project area.

Whitebark pine - Fire is an important component of whitebark pine ecology, as described in the Vegetation section. The continued suppression of wildfires can cause an increase in fire severity in these higher-elevation whitebark pine stands which can have mixed results for whitebark pine. A high-severity fire would likely kill all the whitebark pine individuals in the fire area, as whitebark pine cannot usually withstand such fires. In addition, high-severity fires could have the undesirable effects of burning healthy rust resistant individuals of whitebark pine. However, if seed producing individuals are somewhat nearby, it could provide opportunity for Clark's Nutcracker to cache seeds in the newly burned area for regeneration (USDI Fish and Wildlife Service 2011). At this time of whitebark pine decline, regeneration is of great importance.

Livestock grazing, recreation activities, invasive plants and their control activities within whitebark pine habitat should have little if any impact.

Overall, short-term cumulative impacts to whitebark pine should be minimal, with continued fire suppression and the resulting conifer encroachment having the potential for moderate impacts within the next 50 years.

California false hellebore - Storm damaged roads and culvert replacement activities proposed in the project area could impact California false-hellebore if it occurs along these routes or adjacent to the culvert footprint. Overall, these impacts would be short-term.

Other Sensitive Plant Species - Cumulative impacts to Austin's knotweed, Missoula phlox and California false-hellebore potential habitats should be minimal if at all.

Summary of Effects - No Action

Federally Listed Plants

Due to the lack of federally listed plant species within the Flint Foothills project area, and on the Forest in general, implementation of the no-action alternative would have no effect on listed plants.

Forest Service Sensitive Plants

Wavy Moonwort - In the short term (i.e., next 10-20 years), wavy moonwort would not be impacted by the no-action alternative. However, due to the low viability of the population, it is unlikely that the population will survive in the long term (i.e., over 50 years) due to the natural colonization of the site by conifers without a natural disturbance such as fire. This reduction in viability is unrelated to project activities. Therefore, the no-action alternative would have no impact on wavy moonwort (*Botrychium crenulatum*).

Peculiar and Western Moonworts - Though not found during project surveys, it is likely that peculiar and western moonworts occur within the project area. Impact to these species would be similar to those of wavy moonwort. Therefore the no-action alternative would have no impact to either peculiar moonwort (*Botrychium paradoxum*) or western moonwort (*Botrychium hesperium*).

Whitebark Pine - Whitebark pine is experiencing decline across the west. Under the no-action alternative this decline would naturally continue. The Flint Foothills project was not designed with whitebark pine restoration in mind, and though design features are included to protect them within treatment units, it is unlikely that the lack of treatment would be detrimental to whitebark pine. Therefore, the no-action alternative would have no impact on whitebark pine (*Pinus albicaulis*).

Austin's Knotweed – Austin's knotweed was not found within the project area, however suitable habitat was present on a few shale slopes. Encroachment into these habitats could continue under the no-action alternative regardless of project activities without a natural disturbance such as fire. The no-action alternative would have no impact to Austin's knotweed (*Polygonum douglasii* var. *austiniae*) as none are known to occur within the project area.

Missoula Phlox – Missoula phlox was not found during project surveys, but potential habitat was found in open windswept meadows. Potential habitat could be impacted by the continued encroachment of conifers into open meadows. This would occur regardless of project activities, pending no natural disturbance such as fire. The no-action alternative would have no impact on Missoula phlox populations as none are known to occur within the project area.

California False-Hellebore – California false-hellebore was not found during project surveys, but potential habitat was found in open wet meadows. Potential habitat could be impacted by the continued encroachment of conifers into open wet meadows. This would occur regardless of project activities, without a natural disturbance such as fire. The no-action alternative would have no impact on California false-hellebore populations as none are known to occur within the project area.

Alternative 2 – Proposed Action

Direct and Indirect Impacts

Sensitive moonworts - Moonworts species typically require early successional habitats with periodic disturbances. Timber harvest and road maintenance or construction can both harm moonwort populations by directly damaging individuals or their habitat, while also benefiting the species by creating future potential habitats (Beatty et al. 2003; USDA Forest Service 2000 – Marriott; Ahlenslager and Potash 2007). Under the proposed activity, the abandoned logging road where wavy moonwort occurs in unit 32ST would be re-opened and utilized during the proposed activities. By utilizing this road, most if not all of the known population would be removed or killed during implementation.

The current habitat of the known wavy moonwort population is experiencing conifer encroachment and is not expected to persist long term (i.e., beyond 50 years). Wavy moonwort is not of conservation significance because of the low viability of the population, and would not be protected. There is a chance that the population would return when conditions are favorable post disturbance because wavy moonwort already exists at the site. The disturbances created from project activities could create future habitat for sensitive moonwort species, 10 to 30 years post disturbance (Ahlenslager and Potash 2007).

Peculiar and western moonworts may experience similar impact if present within the project activity area.

Prescribed burning could directly harm moonwort individuals, or indirectly create more open habitat. Zika et al. (1995) state that a number of moonwort habitats were historically maintained by fire and fire suppression has led to vegetative succession and fuel loading, reducing habitat. Since moonworts are known to occur in post-fire habitats, it is presumed that moonworts must either withstand some degree of fire or readily recolonize burned areas from adjacent populations. Short-term impacts to moonwort species from prescribed burning could be direct removal of above ground structures. Long-term impacts could be improved habitat for the next 10-50 years.

Whitebark pine - Approximately 683 acres of whitebark pine occur within the project area, primarily in the higher elevations, but also at mid-elevations and in units 3B, 4B and 5B. The felling of conifers prior to burning activities would avoid areas within units that have concentrations of whitebark pine. Fire ignition patterns would also avoid the use of fire directly in areas of units that have concentrations of whitebark pine.

Wildfire is important for whitebark pine regeneration, as whitebark pine survives low intensity fires and can benefit from stand replacing fire where regeneration is most successful. Arno (1986) suggests that fire is important in perpetuating an abundance of whitebark pine. Morgan et al. (1994) have found that other conifer species tend to replace whitebark pine in the absence of fire. Although burning in whitebark pine stands can assist in whitebark pine regeneration, it is not an objective of the proposed treatment. Direct impacts to whitebark pine from prescribed burning can include damage or death as a result of burning individual trees. Indirect impacts to whitebark pine could include the creation of canopy openings conducive for caching whitebark seed by Clark’s nutcracker birds; hence, increasing potential whitebark pine regeneration. Spring and fall burning would have the same results.

Timber projects have been shown to benefit whitebark pine by reducing competition and allowing for more rapid growth (Keane et al. 2007). Reducing high fuel loads around whitebark pine stands can

also reduce the potential for high-severity wildfires, which can be detrimental to whitebark pine if regeneration is not successful (USDI Fish and Wildlife Service 2011).

Austin's knotweed, Missoula phlox and California false-hellebore - These species all have potential habitats within the project area. These habitats could be improved by implementation of the project activities, as encroaching conifer species would be removed, providing more open areas. It cannot be known whether these species will occupy disturbance areas in the future, but reducing canopy cover coupled with soil disturbance can provide opportunity in some situations.

Cumulative Impacts for Alternatives 2 and 3

Relevant past, present, and future processes and activities have occurred and will continue to occur on Forest Service, private, and state lands within and adjacent to the proposed project area. The following activities could continue to impact sensitive plant populations: Roadside 4 Hazard Tree Removal, timber harvest, livestock grazing and recreational activities (hiking, OHV, hunting, etc.), invasive plants control, wildfire suppression, and prescribed burning and storm damaged road and culvert repairs.

Moonworts - Timber harvest has occurred previously in the units where wavy moonwort occurs along the abandoned logging road in unit 32ST. This previous disturbance likely made the habitat suitable for wavy moonwort and other moonworts to occupy. Natural and man-made disturbances, including fire, are known to create potential moonwort habitats (Zika et al. 1995). The Roadside 4 Hazard Tree Removal project occurring in a portion of the project area intersects with a couple of these known locations. Project activities in these known locations are being buffered to protect individuals. Additional habitat will likely be created by the Roadside 4 Hazard Tree Removal project, as it will open up the canopy creating an early successional, disturbed habitat that is favorable to moonwort species.

Livestock grazing occurs within the project area, and includes the area where wavy moonwort is present (the Hall Allotment). Livestock can impact moonwort species directly by grazing above ground structures, removing reproductive structures, and by trampling (Beatty et al. 2003). Indirectly, livestock can impact moonwort habitat by compacting soils, facilitating the spread of weeds and by changing the plant community (ibid). Currently, the population of moonwort found within the project area shows no signs of being impacted by grazing.

Conifer canopy removal may attract livestock to the population area and increase grazing intensity, which could reduce the chances of the wavy moonwort population returning to the site.

The Douglas Cabin is located in the project area, and recreation activities such as hiking, horseback riding and hunting could occur within the wavy moonwort population area. However, these activities take place at low to moderate levels, and should have little impact on the moonwort population.

Invasive plant species can make occupied and potential habitats unsuitable for sensitive plant species causing long-term impacts. The treatment of invasive plants through various means can benefit sensitive plants by eradication, control, or containment in their habitats. However treatment methods, such as broadcast spraying, can cause short-term harm to sensitive plants if they come into contact with the chemical (USDA Forest Service2000-Ode). The Noxious Weed Control Program Record of Decision for the Beaverhead-Deerlodge National Forest (USDA Forest Service 2002) protects sensitive plants by employing the following mitigation measure:

> "No herbicide will be applied directly on sensitive plants during spot applications and a 100' buffer will be employed around known populations of sensitive plants during broadcast applications (including aerial). All aerial treatment areas will be surveyed for sensitive plants prior to initial spraying."

Invasive plant species treatment activities do occur within the project area, but not within the immediate vicinity of the known wavy moonwort population, as no invasive plants were identified. Invasive plant treatment activities are not known to be posing impacts to sensitive plants within the project area at this time.

Fire suppression can impact sensitive moonwort species by allowing conifer encroachment to alter their existing and potential habitats (Beatty et al. 2003), making it too shady for their existence. Prescribed burning in the past, likely created potential habitat for sensitive moonwort species by reducing canopy cover.

Storm damaged roads and culvert replacement activities proposed in the project area could impact sensitive moonwort populations if they occur along these routes or adjacent to the culvert footprint.

Overall, short-term cumulative impacts to sensitive moonwort species would be minimal. Fire suppression and the resulting conifer encroachment and successional changes over the next 50 years could have moderate impacts on existing sensitive moonwort populations within the project area.

Whitebark pine - Fire is an important component of whitebark pine ecology, as described in the Vegetation section. The continued suppression of wildfires can cause an increase in fire severity in these high-elevation whitebark pine stands, which can have mixed results for whitebark pine. A high-severity fire would likely kill all the whitebark pine individuals in the fire area, as whitebark pine cannot usually withstand such fires. In addition, high-severity fires could have the undesirable effects of burning healthy rust resistant individuals of whitebark pine. However, if seed producing individuals are somewhat nearby, it could provide opportunity for Clark's Nutcracker to cache seeds in the newly burned area for regeneration (USDI Fish and Wildlife Service 2011). At this time of whitebark pine decline, regeneration is of great importance.

Livestock grazing, recreation activities, and invasive plants and treatment activities within whitebark pine habitat would have little if any impact. Overall, short-term cumulative impacts to whitebark pine would be minimal, with the continued fire suppression and the resulting conifer encroachment having the potential for moderate impacts within the next 50 years.

California false hellebore - Storm damaged roads and culvert replacement activities proposed in the project area could impact California false-hellebore if it occurs along these routes or adjacent to the culvert footprint. Overall, these impacts would be short term.

Other Sensitive Plant Species - Cumulative impacts to Austin's knotweed, Missoula phlox and California false-hellebore potential habitats should be minimal if at all.

Summary of Effects

Federally Listed Plants

Due to the lack of federally listed plant species within the Flint Foothills Project area, and on the Forest in general, implementation of the proposed action shall have no effect on listed plants.

Forest Service Sensitive Plants

As stated, direct, and indirect impacts to sensitive plants can result from implementing vegetation management projects.

Wavy Moonwort – Due to the extent of known populations of wavy moonwort in Montana and surrounding states, and the low viability of the population along the abandoned logging road in unit 32ST, implementation of the proposed action, hence removal of the known population, may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species of wavy moonwort (*Botrychium crenulatum*).

Peculiar and Western Moonworts – Due to the likelihood of peculiar and western moonworts occurring within the project area, direct and indirect impacts are possible. Therefore, implementation of the proposed action may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species of peculiar and western moonwort (*Botrychium paradoxum* and *B. hesperium*).

Whitebark Pine – Approximately 683 acres of whitebark pine occur within the project area, primarily in the higher elevations, but also at mid-elevations. Project-specific design features and mitigation measures (chapter 2) are in place to protect clusters of whitebark pine, as described above; however some individuals may be impacted. Implementation of the proposed action may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species of whitebark pine (*Pinus albicaulis*).

Austin's Knotweed – Austin's knotweed was not found within the project area. Suitable habitat was present on a few shale slopes. Potential habitat could be improved by the removal of encroaching conifers. However, the influx of Austin's knotweed into these treated areas is very speculative. As such, implementation of the proposed action alternative would have no impact on Austin's knotweed (*Polygonum douglasii* var. *austiniae*).

Missoula Phlox – Missoula phlox was not found during project surveys, but potential habitat was found in open windswept meadows. Potential habitat could be improved by the removal of encroaching conifers. However, the influx of Missoula phlox into these treated areas is very speculative. Implementation of the proposed action alternative shall have no impact on Missoula phlox (*Phlox kelseyi* var. *missoulensis)*.

California False-Hellebore – California false-hellebore was not found during project surveys, but potential habitat was found in open wet meadows. Potential habitat could be improved by the removal of encroaching conifers. However, the influx of California false-hellebore into these treated areas is very speculative. Implementation of the proposed action alternative would have no impact on California false-hellebore (*Veratrum californicum*).

Alternative 3

Direct and Indirect Impacts

Sensitive moonworts - Moonworts species typically require early successional habitats with periodic disturbances. Timber harvest and road maintenance or construction can both harm moonwort populations by directly damaging individuals or their habitat, while also benefiting the species by creating future potential habitats (Beatty et al. 2003; USDA Forest Service 2000 – Marriott; Ahlenslager and Potash 2007). Under alternative 3, the abandoned logging road in unit 32ST where

wavy moonwort occurs would be re-opened and utilized during the proposed activities. By utilizing this road, most if not all of the known population would be removed or killed during implementation.

The current habitat of the known wavy moonwort population is experiencing conifer encroachment and is not expected to persist long term, beyond 50 years. Wavy moonwort is not of conservation significance because of the low viability of the population, and will not be protected. There is a chance that the population would return when conditions are favorable post disturbance because wavy moonwort already exists at the site. The disturbances created from project activities could create future habitat for sensitive moonwort species 10 to 30 years post disturbance (Ahlenslager and Potash 2007).

Peculiar moonwort and western moonwort may experience similar impact if present within the project activity area.

Prescribed burning could directly harm moonwort individuals, or indirectly create more open habitat. Zika et al. (1995) state that a number of moonwort habitats were historically maintained by fire; therefore, fire suppression has led to vegetative succession and fuel loading reducing habitat. Since moonworts are known to occur in post-fire habitats, it is presumed that moonworts must either withstand some degree of fire or readily recolonize burned areas from adjacent populations. Short-term impacts to moonwort species from prescribed burning could be direct removal of above ground structures. Long-term impacts could be improved habitat.

Whitebark pine - Approximately 683 acres of whitebark pine occur within the project area, primarily in the higher elevations, but also at mid-elevations and in units 3B, 4B and 5B. The felling of conifers prior to burning activities would avoid areas in units that have concentrations of whitebark pine. Fire ignition patterns would also avoid the use of fire directly in areas of units that have concentrations of whitebark pine (EIS design features and mitigation measures).

Wildfire is important for whitebark pine regeneration, as whitebark pine survives low-intensity fires and can benefit from stand-replacing fire where regeneration is most successful. Arno (1986) suggests that fire is important in perpetuating an abundance of whitebark pine. Morgan et al. (1994) have found that other conifer species tend to replace whitebark pine in the absence of fire. Although burning in whitebark pine stands can assist in whitebark pine regeneration, it is not an objective of alternative 3. Direct impacts to whitebark pine from prescribed burning can include damage or death as a result of burning individual trees. Indirect impacts to whitebark pine could include the creation of canopy openings conducive for caching whitebark seed by Clark’s nutcracker birds; hence, increasing potential whitebark pine regeneration. Spring and fall burning would have the same results.

Timber projects have been shown to benefit whitebark pine by reducing competition and allowing for more rapid growth (Keane et al. 2007). Reducing high fuel loads around whitebark pine stands can also reduce the potential for high-severity wildfires from occurring, which can be detrimental to whitebark pine if regeneration is not successful (USDI Fish and Wildlife Service 2011).

Austin’s knotweed, Missoula phlox and California false-hellebore all have potential habitats within the project area. These habitats could be improved by implementation of alternative 3, as encroaching conifer species would be removed, providing more open habitats. It cannot be known whether these species will occupy disturbance areas in the future, but reducing canopy cover coupled with soil disturbance can provide opportunity in some situations.

Cumulative Impacts

Cumulative impacts are the same as for the proposed action alternative and are addressed previously.

Summary of Effects

Federally Listed Plants

Due to the lack of federally listed plant species within the Flint Foothills Project area, and on the Forest in general, implementation of alternative 3 shall have no effects on listed plants.

Forest Service Sensitive Plants

As stated, direct, and indirect impacts to sensitive plants can result from implementing vegetation management projects.

Wavy Moonwort – Due to the extent of known populations of wavy moonwort in Montana and surrounding states, and the low viability of the population along the abandoned logging road in unit 32ST, implementation of alternative 3, hence removal of the known population, may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species of wavy moonwort (*Botrychium crenulatum*)

Peculiar Moonwort and Western Moonwort – Due to the likelihood of peculiar moonwort and western moonwort occurring within the project area, direct and indirect impacts are possible. Therefore, implementation of alternative 3 may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species of peculiar and western moonwort (*Botrychium paradoxum* and *B. hesperium*).

Whitebark Pine – Whitebark pine is known to occur within the project area. Project design features and mitigation measures (chapter 2) are in place to protect clusters of whitebark pine, as described above; however some individuals may be impacted. Implementation of alternative 3 may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species of whitebark pine (*Pinus albicaulis*).

Austin's Knotweed – Austin's knotweed was not found within the project area. Suitable habitat was present on a few shale slopes. Potential habitat could be improved by the removal of encroaching conifers. However, the influx of Austin's knotweed into these treated areas is very speculative. As such, implementation of alternative 3 would have no impact on Austin's knotweed (*Polygonum douglasii* var. *austiniae*).

Missoula Phlox – Missoula phlox was not found during project surveys, but potential habitat was found in open windswept meadows. Potential habitat could be improved by the removal of encroaching conifers. However, the influx of Missoula phlox into these treated areas is very speculative. Implementation of alternative 3 would have no impact on Missoula phlox (*Phlox kelseyi* var. *missoulensis*).

California False-Hellebore – California false-hellebore was not found during project surveys, but potential habitat was found in open meadows. Potential habitat could be improved by the removal of encroaching conifers. However, the influx of California false-hellebore into these treated areas is very speculative. Implementation of alternative 3 would have no impact on California false-hellebore (*Veratrum californicum*).

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Beaverhead-Deerlodge Land and Resource Management Plan (Forest Plan)

This alternative complies with the Forestwide goals stated in the Forest Plan in regards to sensitive plants. The Forest Plan provides direction for management of sensitive plants to maintain and restore sensitive plant populations and their habitats. Large core populations or fringe-of-range populations of sensitive plants are conserved in research natural areas and botanical special interest areas, or protected as populations in conservation strategies, or project design specifications. Neither the whitebark pine nor the moonwort populations within the project area is considered a large core or fringe-of-range population. The loss of individuals will not lead towards a loss of viability or a trend towards federal listing.

Forest Service Manual 2600 Wildlife, Fish and Sensitive Plant Habitat Management

Forest Service Manual 2600 directs the biological evaluation process as a means to ensure that Forest Service actions do not contribute to loss of viability for any native or desired nonnative plant, or contribute to loss of viability for animal species, or trends toward Federal listing of any species. Through this process, it has been determined that implementation of either of the action alternatives identified for the Flint Foothills Project will not lead to a loss of viability or a trend towards federal listing for either moonwort species or whitebark pine

Invasive Plants

Introduction

This section analyzes the impact of proposed project activities on invasive plants and noxious weed species within the Flint Foothills Project boundary.

According to Forest Service Manual 2900 – Invasive Species Management, invasive species are defined as "…an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health." The term "noxious weed" typically describes species of plants that have been determined to be undesirable or injurious in some capacity. Federal noxious weeds are regulated by USDA-Animal and Plant Health Inspection Service (APHIS) under the Plant Protection Act of 2000 (appendix A of the Invasive Plants Report in the project file).

State statues for noxious weeds vary widely but Montana is a progressive state, defining laws and regulating noxious weeds. According to the Montana Weed Management Plan (2008), a weed attains a "noxious" status by Rule as described in the Montana County Weed Control Act (revised October 2011). It further defines noxious weeds as "…plants of foreign origin that can directly or indirectly injure agriculture, navigation, fish or wildlife, or public health." Currently there are 32 weeds on the statewide noxious weed list. Each noxious weed is placed into a category based on the priority of eradication, containment, and education (more information is available in appendix B of the Invasive Plants report in the project file). Priority 1 weeds are either not present in Montana or have limited presence in Montana. Management criteria require eradication and education. Priority 2 weeds are common or abundant in Montana. Management criteria require eradication or containment and management is prioritized by local weed districts. Priority 3 weeds are not Montana listed noxious weeds but are regulated plants. The State recommends research, education and prevention to minimize the spread of the regulated plant.

To simplify terminology, all invasive plants and noxious weeds referenced in this analysis will collectively be called invasive plant species. This will include all the species listed on the Federal and Montana Noxious Weed lists as well as cheatgrass (*Bromus tectorum*) and musk thistle (*Carduus nutans*).

Overview of Issues Addressed

The establishment and spread of invasive species is considered to be one of the top threats to National Forest System ecosystem health. The threat from invasive plant species to native plant communities, especially arid rangeland plant communities, has been well documented (Zouhar 2001 and 2003).

Several comments expressed concern over the potential spread of invasive plant species caused by treatment activities. One concern was road construction and the subsequent use could create ideal conditions for weed establishment. The commenters encouraged minimizing or eliminating construction of both temporary and system roads because roads could cause establishment of weeds. To address this concern, alternative 3 was developed to exclude new road construction. The action alternatives differ by the miles of NFS road construction, and the miles of temporary road construction. Other examples of concerns received during scoping were the presence of invasive plant species on roads within burn units, the chance of invasive plant species expansion within prescribed burn units, the impacts of current invasive plant species infestations within the project area, invasive plant species overtaking native plant populations, and long-term commitment to treating invasive plant species. These concerns and more will be addressed in this section.

It is well documented that disturbed soil is highly susceptible to the establishment of invasive plant species and that invasive plant infestations can alter the composition and function of native plant communities (Prieur-Richard & Lavorel 2000). In addition, certain management actions can potentially increase the density and spread of invasive plant species. Due to these factors, the following measurement indicators will be used to help identify the risk of invasive plant species spread and establishment within the project area:

Measurement Indicators

The measurement indicators used to evaluate impacts of alternatives:

The following indicators are factored into the overall risk of invasive plant species becoming established and/or spreading in proposed treatment units within the project area (see Methodology)

- Acres of ground disturbance such as skid trails, log landings and burn piles susceptible to establishment by invasive plant species
- Susceptibility of an environment to the establishment of invasive species (invasibility)
- Miles of road construction
- Presence or absence of invasive plant species within proposed treatment unit
- Effectiveness of past and future invasive plant species control efforts

Affected Environment

Existing Condition

An aggressive invasive plant species management program has been in place on the Pintler Ranger District since the mid-1980s. This program has included a variety of control and management efforts including education, as well as mechanical, biological, and chemical treatments. These efforts have

been effective in reducing the total acres of invasive plant species within the Flint Foothills Project area.

In 2000, the Pintler Ranger District inventoried invasive plant species (only the species found on the Montana Noxious Weed List in 2000) for the Beaverhead-Deerlodge National Forest Noxious Weed Control Plan (USDA Forest Service 2002) and again in 2011 (all priority categories on the current Montana Noxious Weed List). These inventoried populations of invasive plant species consist mostly of point, linear, and polygon infestations within the project area. Point infestations generally consist of widely scattered individual plants. Linear infestations typically consist of widely scattered populations of invasive plant species along motorized routes. Polygon infestations consist of measurable areas of less than 0.1 acre in size to several acres.

The 2000 inventory identified 1,675 acres of invasive plant species within the Flint Foothills Project area (table 38). Invasive plant species found during that inventory included spotted knapweed (*Centaurea maculosa*), musk thistle (*Carduus nutans*) and yellow toadflax (*Linaria vulgaris*). The 2011 inventory identified 802 acres of invasive plant species within the project area, predominantly within rangeland vegetation types, along abandoned roads, old log landings and along existing roadsides (table 38). Invasive plant species identified in the 2011 inventory include musk thistle, spotted knapweed, yellow toadflax, Canada thistle (*Cirsium arvense*), houndstongue (*Cynoglossum officinale*), oxeye daisy (*Chrysanthemum leucanthemum*), common tansy (*Tanacetum vulgare*) and cheatgrass (*Bromus tectorum*).

Table 38. Acres of invasive plant species identified in the Flint Foothills project area in 2000 and 2011

Invasive plant species	2000 Inventoried Acres	2011 Inventoried Acres
Spotted knapweed	1,660	525
Yellow toadflax	6	15
Musk thistle	9	139
Houndstongue	0	73
Canada thistle	0	42
Ox-eye daisy	0	4
Common tansy	0	3
Cheatgrass	0	1
Total	**1,675**	**802**

Yellow toadflax, musk thistle, and cheatgrass were not on the Montana Noxious Weed list at the time of the 2000 inventory. The 2010 Montana Noxious Weed List has yellow toadflax listed as a Priority 2B, while musk thistle and cheatgrass are not considered noxious. However, cheatgrass is considered a regulated plant and categorized as Priority 3. Refer to the "Introduction" section for definitions of the priorities.

Spotted knapweed is the predominant invasive plant species present within the project area. It is mainly located in mountain grassland plant communities, along roads, and in the drier open-canopy forest plant communities. Musk thistle is found in low densities within mountain grassland communities. Many of these individuals were found where excessive rodent activity had disturbed the soil allowing musk thistle to establish. The increase in musk thistle is due to the difference in mapping technique. For the 2011 inventory, sporadic locations of musk thistle were lumped to make polygons rather than individual points. For example, a 15-acre mountain-grassland park may contain one musk thistle plant per acre (on a gopher mound) and be mapped as a 15-acre polygon rather than 15 individual points. This displays as an increase in acres infested with musk thistle, but it is important to note that musk thistle is not invading native plant communities, rather being

opportunistic with disturbed microsites. Musk thistle and Canada thistle were also found in isolated patches where past burn piles existed. All other invasive plant species were found in small patches or as individuals and mostly tied to motorized, wheeled, vehicle routes. Figure 25 that follows displays current locations for the invasive plant species in this analysis.

The 2011 inventory found little to no invasive plant species expansion within historic lodgepole pine and Douglas fir harvest units. The majority of invasive plant species found within those units were in burn piles and open and closed haul routes.

These inventories indicate that the Pintler Ranger District Invasive plant species Control Program has reduced invasive plant species infested acres by 48 percent over the last 10 years. Existing infestations within the project area are currently being treated with herbicides on an annual basis by Forest Service invasive plant species control crews, or by contract, and will continue to be treated into the foreseeable future. The current invasive plant species control program is operating under the 2002 Beaverhead-Deerlodge National Forest Noxious Weed Control Environmental Impact Statement and Record of Decision (USDA, 2002). The invasive plant species control program on the Pintler Ranger District has been funded through National Forest Appropriation funding, Resource Advisory Committee (RAC) grants, Rocky Mountain Elk Foundation, Sikes Act grants and Knutson-Vandenberg (KV) funds. KV funds are funds that the Forest Service is allowed to collect from harvest activities for resource enhancement, protection, and improvement work in the vicinity of the harvest area.

Several biological control agents have been introduced into invasive plant species infestations within the project area. *Urophora affins* is a fly that attacks the flower head of spotted knapweed. *Cyphocleonus achates* is a weevil that attacks the roots of spotted knapweed. In addition, *Larinus minutus* is a seed head eating weevil that is established in this area. Although none of these insects were observed during the 2011 inventory, they are believed to exist within the project area. In 2010, the United States Forest Service Rocky Mountain Research Station released *Mecinus janthinus*, a stem mining weevil to control yellow toadflax. The Research Station will study the effects of this agent on yellow toadflax in this area and local climate.

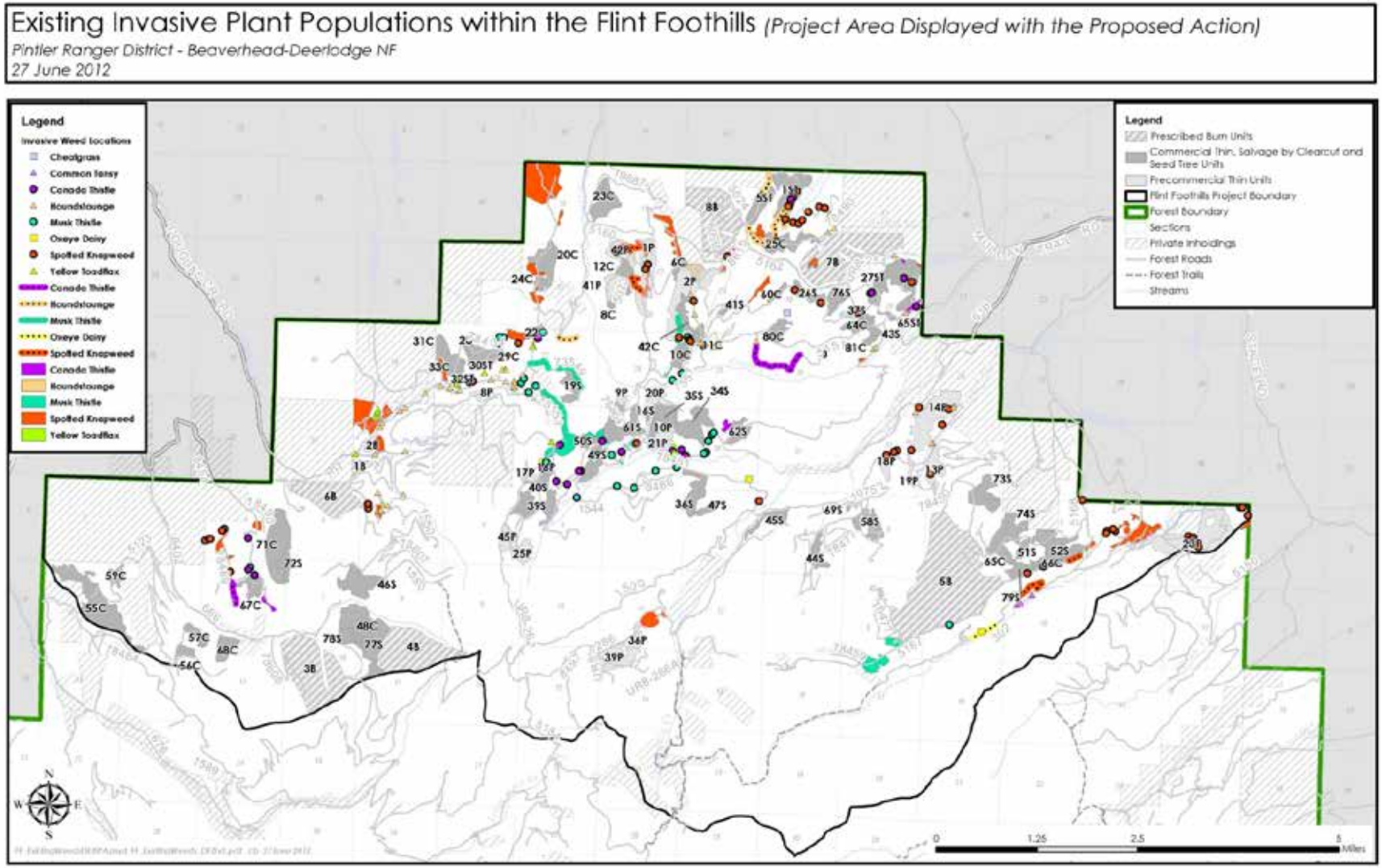


Figure 25. Existing Invasive plant species in the project area

Desired Condition

The 2009 Beaverhead-Deerlodge National Forest Land and Resource Management Plan (Forest Plan) identified the following applicable Forestwide goals for invasive plant species:

Invasive Plants/Noxious Weeds

- The influx of persistent nonnative species is minimized by using native plants, seed, and vegetative propagules for Vegetation Management work (Forest Plan, p. 43)
- Diagnosed pest problems are addressed with an integrated pest management approach, which allows monitoring, prevention, cultural, mechanical, biological, genetic and chemical techniques (Forest Plan, p. 43)
- Prevent, reduce, or eliminate infestations of nonnative or noxious weed species with emphasis on areas where there is a high likelihood of establishment and spread. Manage noxious weeds using integrated pest management techniques as described in the most current Beaverhead-Deerlodge Noxious Weed Control Record of Decision (Forest Plan p. 44).

Invasive plant species inventories completed in 2000 and 2011 within the project area indicate that infestations are still present but total acres infested has been reduced by 48 percent under the current weed control program. Suppressing invasive plant species is vital in order to protect biodiversity and enhance native vegetation. Therefore, invasive plant species monitoring and treatment needs to continue to effectively control the establishment and spread of invasive plant species as well as decrease the number of infested acres within the project area.

Environmental Consequences

Methodology

Discussions of environmental direct and indirect effects will focus on the “risk” of invasive plant species becoming established and/or spreading in proposed treatment units within the project area. In the context of this analysis, risk is defined as the probability, or potential (i.e., low, moderate, high), that (1) invasive plant species seed would be transported and then deposited into areas that are currently not infested by weeds, and (2) proposed treatment activities would increase the density and spread of invasive plant species within the project area.

Understanding the interactions among invasive plant species, native plant communities and the proposed treatments of this project requires an understanding of invasibility. Invasibilty is the susceptibility of a plant community to invasion (Smith and others 2008). This is determined by many factors including the existing vegetation, available nutrients, availability of seed from invasive plants, and amount of past human activity in the area. Generally, within this project area, the areas in the lower elevations have increased likelihood of invasion than the higher elevation areas. This is mainly due to the associated human activities in the area such as roads, livestock grazing, recreation as well as the readily available seed source from existing invasive plant species.

During the summer of 2011, the project area was surveyed and invasive plant species mapped using on-the-ground field observations (more information is available in appendix A of the Invasive Plants report in the project file). The surveys were completed by District Range Technicians whose primary job is weed treatment as well as the District’s Rangeland Management Specialist who manages the invasive plant species program. If invasive plant

species were detected, a location was recorded with a GPS unit and data was collected regarding the species, gross area, percent infested, percent canopy cover, and any associated invasive plant species present. Risk level includes the proximity of the infestations to the proposed treatment units, haul routes, unauthorized routes, and the invasibility of the land.

Incomplete and Unavailable Information

Although a thorough survey was completed within the project area for invasive plant species, it is possible that not all weed infestations were detected. Small infestations with very few plants can be extremely hard to detect and map.

Spatial and Temporal Context for Effects Analysis

To effectively describe the environmental effects of project actions on invasive plant species, the environmental consequences, including cumulative effects discussions, will focus on National Forest System (NFS) lands within the boundaries of the project area. Specific emphasis will be placed on activity areas where vegetation treatment and road construction are proposed.

This analysis will discuss both short-term (1 year or less), and long-term (greater than 1 year) project effects to invasive plants within the project area. The analysis will focus on potential establishment and spread within proposed treatment units and connected actions associated with treatment activities such as temporary road construction.

Invasive plant species can have persistent, long-lasting effects on native plant communities. The duration of these effects is highly dependent upon the severity of the infestation and the difficulty in controlling certain invasive plants. For the Flint Foothills Project, the temporal boundary for project effects would be approximately 10 years. This boundary takes into account the approximate life of the project, including potential activities such as invasive plant species control within treatment units.

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Table 24 at the beginning of chapter 3 discloses the present and reasonably foreseeable actions within the project area that are relevant to this DEIS analysis. Past and present activities such as motorized vehicle access, invasive plant species control and livestock grazing have influenced the spread and establishment of invasive species within and adjacent to the project area. All three have played a role to introduce new species and expand the distribution of existing species. In addition, all three are expected to continue into the future, and will be analyzed in cumulative effects.

Alternative 1 – No Action

Direct Effects

There are no direct effects from choosing the no-action alternative.

Indirect Effects

Under this alternative, no project activities would occur. However, previously approved and ongoing activities such as livestock grazing, motor vehicle travel, and firewood cutting would continue. These activities would continue to provide potential vectors for weed spread and establishment. Even in the absence of these ongoing activities there would be potential for

weeds to invade. Invasive plant species such as spotted knapweed and cheatgrass can establish shortly after disturbance or invasion can be accelerated by disturbance. In addition, they can also invade relatively undisturbed perennial native plant communities where there is natural ground disturbance from rodents or predators digging in the soil and weed seeds can be dispersed over long distances by animals and birds (Zouhar 2001 and 2003).

Cumulative Effects

Livestock Grazing

Livestock and native ungulates can act as dispersal agents for weed seed movement. Livestock grazing activities can also result in ground disturbance that is susceptible to invasion by weeds (Frost & Launchbaugh 2003). There is low potential for livestock grazing activities to result in measureable spread of invasive plant species into uninfested lands within the project area because of existing levels of invasive plant infestations, ongoing treatment efforts, and the effectiveness of past invasive plant species control efforts.

Invasive Plant Species Control

In accordance with the Beaverhead-Deerlodge National Forest Noxious Weed Control EIS (2002), treatments of existing invasive plant species infestations would continue to occur annually. The Pintler Ranger District has an active and proven effective weed control program which would continue to benefit native plant communities within the project area by containing and reducing the coverage and density of existing and future invasive plant species infestations.

Public Actions on National Forest System Lands (Motor Vehicle Travel)

Current and future motor vehicle travel on open roads would result in a continued, long-term threat of invasive plant species being introduced and spread within the project area. Motorized vehicles have a potential for spreading invasive plants because they carry seeds and propagules in tires and underneath the vehicle. Roads are a primary source for seed dispersal because they offer disturbed ground. Although the Forest Service (FS) requires certain weed prevention practices be followed by its employees and contractors, it does not require the general public to adhere to weed prevention practices. However, the Forest Service does expend money and time educating the public on the importance of not spreading invasive plant species and proper weed prevention practices. There is low potential for continued use of open, motorized roads by the public to result in measureable weed spread into uninfested lands within the project area because of existing levels of invasive plant species infestation, ongoing treatment efforts, and the effectiveness of past invasive plant species control efforts,

Summary of Effects

Implementation of the no-action alternative would not result in any additional risk of invasive plant establishment and spread over what is currently occurring within the project area. Based on existing levels of invasive plant species infestation, ongoing treatment efforts, and the effectiveness of past invasive species control efforts, the cumulative potential of ongoing and reasonably foreseeable future activities is expected to result in a low risk of weeds being spread. Treatment of existing invasive plant species infestations would continue to occur annually in accordance with the Beaverhead-Deerlodge National Forest Noxious Weed Control EIS (2002).

Alternative 2 – Proposed Action

Direct and Indirect Effects

Table 39 displays the proposed treatment units where invasive plant species were found during the 2011 invasive plant species inventory.

Table 39. Proposed activities in units containing invasive plants species 2011

Silvicultural Prescription	Unit Number
Commercial thinning	06C, 20C, 22C, 24C, 25C, 31C, 66C
Salvage by clearcut harvest	19S, 50S, 61S, 79S
Precommercial thinning	01P, 02P, 13P, 14P, 16P, 21P, 23P, 42P
Seed tree with reserves	01ST, 05ST, 27ST
Prescribed burning	02B, 05B, 06B, 07B, 08B

In addition to the units in table 39, a small component or a few individuals of invasive plant species were found along the majority of existing NFS roads that would be used as haul routes. It was also observed during the 2011 inventory of units within the project area, that invasive plant species were along abandoned temporary routes and burn piles but were not expanding out into the moister open-canopy forest and closed-canopy forest units. The most common weeds found along the temporary routes and burn piles were Canada thistle and musk thistle. Spotted knapweed was located in random areas, mainly in dry mountain-grassland and southern aspect open-canopy forest sites.

The 2011 inventory determined that invasive plant species and seed could be dispersed within the project area by the activities in this proposal. Specifically, areas of concern for the greatest risk of establishment by invasive plant species are the newly constructed temporary roads (7.2 miles), the newly constructed NFS road (1.3 miles), skid trails, log landings, and high-severity burned areas such as burn piles. It is also expected that invasive plant species would increase along haul routes due to the increased traffic on the roads associated with the proposed treatments.

Based on the 2011 inventory and referenced literature, there is high risk for spotted knapweed, musk thistle and Canada thistle to become established in the areas of concern. This is due to increased vehicular travel and increased potential for soil disturbing activities from logging operations. This may occur during the treatment itself or indirectly by wind, wildlife, cattle, and humans following treatments. The remaining invasive plant species have a low potential to establish in the areas of concern because these species are infrequent and in low densities. In addition, there is low potential for all invasive plant species to become established outside of disturbed areas of concern within treatment areas.

This alternative also proposes approximately 1,990 acres of prescribed burn treatments as well as post-harvest underburning in the commercial thin units and seed tree with reserves units. Prescribed burning as well as post-harvest underburning typically occurs in the spring or fall. Burning during these seasons usually produces a low-severity burn. Low severity refers to fires that cause little alteration to the soil, and little mortality to underground plant parts or seed banks (Smith et al. 2008). Most literature supports the notion that invasive plant species have a lower potential of establishment and expansion following low-severity fires (Ferguson & Craig

2008). In addition, the risks of invasion increases if the pre-fire vegetation already has a significant component of invasive plant species present (Goodwin, Sheley and Clark 2002).

The mid-elevation and north facing prescribed burn units have a low invasibility rating due to the existing closed-canopy vegetation, higher elevation, shorter growing season, cooler temperatures, less human-caused disturbances and ultimately fewer existing weed infestations. However, the low elevation and south facing burn units have a higher invasibility rating because of a more open canopy, longer growing season, higher percentage of existing invasive plant species cover and more human-caused disturbances. The two main species of concern associated with prescribed fire is spotted knapweed and Canada thistle. All the other inventoried invasive plant species are of little concern because they have a very low potential of invasion or make up a small percentage of infested acres.

Research has found that spotted knapweed is not a serious threat in lodgepole/subalpine fir forest following fire (Ferguson & Craig 2010), and its abundance was not changed by early spring prescribed burning in Montana (Smith et al. 2008). The 2011 inventory showed little spotted knapweed expansion into past prescribed fire units. Therefore, spotted knapweed has a low risk to establish or expand within the burning units except for Units 2B and 7B, They are lower-elevation units and have existing infestations of spotted knapweed in or adjacent to them. Due to this fact, spotted knapweed has a moderate risk of expanding in the western portion of unit 7B and all of unit 2B.

Invasive plant species with small, wind-dispersed seed such as Canada thistle and musk thistle tend to increase 2 to 4 years after fire, after which their numbers decline (Smith et al. 2008). After a fire in Grand Teton National Park, Canada thistle cover increased to 5 percent but by 17 years post fire, had decreased to less than 1 percent. Canada thistle would have the opportunity to become established in all of the burn units but evidence from the 2011 inventory and referenced research demonstrated that it would not persist within a unit. However, it may persist within high-severity burns such as burn piles. Therefore, Canada thistle has a moderate potential to expand into burn units but should decrease with time and only persist in areas of high burn severity such as burn piles.

Therefore, based on project design features, mitigation measures, and the presence of mostly small, low-density invasive plant species infestations in 27 of the 93 proposed units, as well as effectiveness of ongoing and past control efforts, this alternative is estimated to have an overall low risk of increasing the density and spread of invasive plant species into uninfested lands, and a moderate risk of invasive plant species spreading and establishing in the areas of concern (highly disturbed). This moderate risk rating would also apply to haul routes used for project activities. The rationale for the low risk rating is:

1. Existing weed infestations within the proposed treatment units are small.
2. Monitoring and treatment of infestations within treatment units, burn piles, haul routes and temporary roads would occur as necessary focusing on the areas of concern.
3. The invasive plant species control program has been successful in reducing invasive plant species infestations despite past uses such as livestock grazing, recreation and timber harvest activities. Present and past invasive plant species treatments have been effective in reducing acres of invasive plant species infestations by 48 percent within the project area

4. Commitment to post-activity monitoring and treatment of invasive plant species infestations found within proposed units would result in a high success potential for controlling these weed occurrences within three to five years post treatment
5. Greater attention and funding to control invasive plant species in the project area would result from this alternative.

In the long term, the persistent treatment of invasive plant species infestations would continue to reduce the size and density of existing infestations.

Cumulative Effects

Livestock Grazing

Livestock and native ungulates can act as dispersal agents for seed movement. Livestock grazing activities can also result in ground disturbance that is susceptible to invasion by weeds (Frost & Launchbaugh 2003). There is low potential for livestock grazing activities to result in measureable weed spread into uninfested lands within the project area because of existing levels of invasive plant species infestation, ongoing treatment efforts, and the effectiveness of past invasive plant species control efforts.

Weed Control

In accordance with the Beaverhead-Deerlodge National Forest Noxious Weed Control EIS, treatments of existing invasive plant species infestations would continue to occur annually. The Pintler Ranger District has an active and effective weed control program that would continue to benefit native plant communities within the project area by containing and reducing the coverage and density of existing and future invasive plant species infestations.

Public Actions on Forest Service Lands (Motor Vehicle Travel)

Current and future public actions such as motor vehicle travel on open roads, forest product gathering, hunting, and recreation would result in continued, long-term threat of invasive plant species being introduced and/or spread within the project area. Motorized vehicles have a potential for spreading invasive plants because they carry seeds and propagules in tires and underneath the vehicle. Roads are a primary source for seed dispersal because they offer disturbed ground. Although the Forest Service (FS) requires certain weed prevention practices be followed by its employees and contractors, it does not require the general public to adhere to weed prevention practices. However, the FS does expend money and time educating the public on the importance of not spreading invasive plant species and proper weed prevention practices. There is low potential for continued use of open, motor vehicle routes by the public to result in measureable weed spread into uninfested lands within the project area because of existing levels of invasive plant species infestation, ongoing treatment efforts, and the effectiveness of past invasive plant species control efforts.

The cumulative potential of ongoing and reasonably foreseeable future activities as well as the implementation of the proposed action is expected to result in low risk of invasive plant species being spread and established within the treatment units, but moderate risk of invasive plant species being spread and established on the areas of concerns. Treatment of existing invasive plant species infestations as well as new infestations would continue to occur in accordance with the Beaverhead-Deerlodge National Forest Noxious Weed Control EIS (2002). A high success rate is expected because past weed control efforts have been successful in limiting the rate of spread, infested acres, and reducing plant density within the project area. Present and

past control efforts have reduced infested acres of invasive plant species by 48 percent within the project area. In addition, the identified project design features and mitigation measures (chapter 2) would lower the risk of invasive plant species spread and establishment

Summary of Effects

Implementation of the proposed action, as well as continued livestock grazing and public actions such as motorized vehicle travel would likely increase the number of small infestations of spotted knapweed, Canada thistle and musk thistle in isolated areas of concern (highly disturbed). No invasive plant species are likely to expand into the treatment units where there is little ground disturbance; however, where there is disturbance, there will be a higher probability of the three species becoming established.

The cumulative potential of ongoing and reasonably foreseeable future activities as well as the implementation of the proposed action is expected to result in low risk of invasive plant species being spread and established within the treatment units but moderate risk of being spread and established on the areas of concerns.

Monitoring Recommendations

Post activity monitoring and treatment should occur as long as necessary to ensure that existing infestations do not expand and new infestations are controlled. It is recommended that the units, haul routes, temporary roads, and burn piles be identified as high priority monitoring and treatment areas.

Alternative 3

Direct and Indirect Effects

The direct effects are similar for alternative 3 as described in the alternative 2 discussion previously, with one main exception. Alternative 3 was developed without the road component that is in alternative 2 (7.2 miles of newly constructed temporary road and 1.3 miles of newly constructed NFS road). Therefore, the areas of concern for this alternative would be limited to skid trails, log landings, and high-severity burned areas such as burn piles. This alternative would decrease the overall opportunity for invasive plant species to spread or become established, thereby reducing the number of expected new small infestations. However, this alternative is expected to increase the number of small infestations of invasive plant species within the project area compared to the no-action alternative.

Several units have been dropped in this alternative. However, none of the dropped units contained invasive plant species that were found with the 2011 inventory.

Therefore, based on project design features, mitigation measures, and the presence of mostly small, low-density invasive plant species infestations in 27 of the 83 proposed units, as well as effectiveness of ongoing and past control efforts, this alternative is estimated to have an overall low risk of increasing the density and spread of invasive plant species into uninfested lands, and moderate risk of invasive plant species spreading and establishing in the areas of concern (highly disturbed). This moderate risk rating would also apply to haul routes used for project activities. The rationale for this low risk rating is:

1. Existing weed infestations within the proposed treatment units are small.

2. Monitoring and treatment of infestations within treatment units, burn piles, and haul routes would occur as necessary, focusing on the areas of concern.
3. The invasive plant species control program has been successful in reducing invasive plant species infestations despite past uses such as livestock grazing, recreation and timber harvest activities. Present and past treatments have been effective in reducing acres of invasive plant species infestations by 48 percent within the project area.
4. Commitment to post-activity monitoring and treatment of invasive plant species infestations found within proposed units would result in high success potential for controlling these weed occurrences within 3 to 5 years post treatment.
5. Greater attention and funding to control invasive plant species in the project area would result from this alternative

In the long term, the continued treatment of invasive plant species infestations would continue to reduce the size and density of existing infestations.

Cumulative Effects

Livestock Grazing

Livestock and native ungulates can act as dispersal agents for seed movement. Livestock grazing activities can also result in ground disturbance that is susceptible to invasion by weeds (Frost & Launchbaugh 2003). There is low potential for livestock grazing activities to result in measureable weed spread into uninfested lands from the project area because of existing levels of weed infestation, ongoing treatment efforts, and the effectiveness of past weed control efforts.

Weed Control

In accordance with the Beaverhead-Deerlodge National Forest Noxious Weed Control EIS (2002), treatments of existing invasive plant species infestations would continue to occur annually. The Pintler Ranger District has an active and proven effective weed control program which would continue to benefit native plant communities within the project area by containing and reducing the coverage and density of existing and future invasive plant species infestations.

Public Actions on National Forest System Lands (Motorized Vehicle Travel)

Current and future motorized vehicle travel on open roads would result in a continued, long-term threat of invasive plant species being introduced or spread within the project area. Motorized vehicles have potential for spreading invasive plants because they carry seeds and propagules in tires and underneath the vehicle. Roads are a primary source for seed dispersal because they offer disturbed ground. Although the Forest Service requires certain weed prevention practices be followed by its employees and contractors, it does not require the general public to adhere to weed prevention practices. However, the FS does expend money and time educating the public on the importance of not spreading invasive plant species and proper weed prevention practices. There is low potential for continued use of open, motorized roads by the public to result in measureable invasive plant species spread into uninfested lands within the project area because of existing levels of invasive plant species infestation, ongoing treatment efforts, and the effectiveness of past invasive plant species control efforts.

The cumulative potential of ongoing and reasonably foreseeable future activities as well as the implementation of alternative 3 is expected to result in low risk of invasive plant species being

spread and established within the treatment units, but moderate risk of being spread and established on the areas of concerns. Treatment of existing invasive plant species infestations would continue to occur in accordance with the Beaverhead-Deerlodge National Forest Noxious Weed Control EIS (2002). A high success rate is expected because past weed control efforts have been successful in limiting the rate of spread, infested acres, and reducing plant density within the project area. Present and past control efforts have reduced infested acres of invasive plant species by 48 percent within the project area. In addition, the identified project design features and mitigation measures (chapter 2) would decrease the potential of invasive plant species spread and establishment

Summary of Effects

Implementation of the alternative 3, as well as continued livestock grazing and public actions such as motorized vehicle travel would likely increase the number of small infestations of spotted knapweed, Canada thistle and musk thistle in isolated areas of concern (highly disturbed). No invasive plant species are likely to expand into the treatment units where there is little ground disturbance; however, where there is disturbance, there will be a higher probability of the three species becoming established.

This alternative reduces the potential for invasive plant species to spread and become established compared to the proposed action because it does not include newly constructed road. However, all the other proposed activities are similar to the proposed action. Therefore, a similar outcome is expected, but with fewer small infestations in isolated areas.

The cumulative potential of ongoing and reasonably foreseeable future activities as well as the implementation of alternative 3 is expected to result in low risk of invasive plant species being spread and established within the treatment units but moderate risk of being spread and established on the areas of concerns.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Beaverhead-Deerlodge Land and Resource Management Plan (Forest Plan)

Both action alternatives comply with the Forestwide goals stated in the Forest Plan in regards to invasive plant species. The Forest Plan provides direction for management of invasive plant species in regards to prevention, reduction, or elimination of infestations of nonnative or noxious weed species with emphasis on areas where there is high likelihood for establishment and spread. The plan also directs that weeds are managed through an integrated pest management approach as described in the most current Beaverhead-Deerlodge Noxious Weed Control Record of Decision. Under the proposed action alternative, an integrated pest management approach would continue to be used to control invasive plant species within the project area.

Forest Service Manual 2900 - Invasive Plant Species Management

Forest Service manual 2900 gives direction which sets forth National Forest System policy, responsibilities, and direction for the prevention, detection, control, and restoration of effects from aquatic and terrestrial invasive plant species (including vertebrates, invertebrates, plants, and pathogens). Under the proposed action alternative, an integrated pest management approach would continue to be used to manage invasive plant species on the Pintler Ranger District.

Wildlife

Introduction

This analysis focuses on potential impacts to the wildlife resource as a result of proposed treatments and activities. This document analyzes the potential effects from the proposed action activities to any wildlife that are federally listed as threatened or endangered species, and to Forest Plan (USDA 2009) management indicator species (MIS).

Overview of Issues Addressed

Through the public scoping process, Montana Fish, Wildlife, and Parks identified the need to contain wildlife attractants at project implementation sites. Other elements identified in scoping as important to address include threatened and endangered species and habitats, sensitive species and habitats, northern goshawk habitats, snag and coarse wood retention, old growth habitat, big game habitats, and road impacts to wildlife.

Measurement Indicators

The indicators used to evaluate impacts of alternatives vary by wildlife resource addressed and consist, at least in part, of:

- Acres of habitat affected
- Open motorized road and trail densities (OMRTDs)
- Density of habitat resources such as snags and downed logs.
- Acres and proportion of secure habitat affected
- Measures for changes in habitat will be acres of treatments compared to the amount of suitable habitat available (by species).

Affected Environment

Existing Condition

Wildlife Habitats

There are several vegetation types that occur in the Flint Creek Mountains that range from subalpine and whitebark pine habitats to sagebrush and grasslands at lower elevations. Each vegetation type contributes various habitat requirements to different species. Table 40 shows acres and size classes of vegetation types on National Forest System lands within the project area.

Table 40. Size class distribution by dominance group, National Forest Systems lands within the project area

Cover Type	Acres on NFS Lands	Percentage of NFS Lands	Existing Tree Size Classes (acres)			
			Early seral (0-4.9 inches d.b.h.)	Mid-seral (5-9.9 inches d.b.h.)	Advanced seral (10-14.9 inches d.b.h.)	Late seral (15 inches+ d.b.h.)
Aspen	95	<1	unspecified			
Dry grasslands, meadow	1,930	5	-	-	-	-
Sbrubland - mesic	146	<1	-	-	-	-
Wet meadow	68	<1	-	-	-	-
Douglas-fir	13,534	37	483	1,831	11,134	86
Lodgepole pine	17,646	48	1,074	8,729	7842	1
Ponderosa pine	226	<1	31	181	6	8
Whitebark pine	625	2	15	189	421	0
Spruce/fir	615	2	43	4	557	11
Water	55	<1	-	-	-	-
Sparsely vegetated	2,065	6	-	-	-	-

Based on Vmap satellite imagery interpretation

Commercial timber harvest has occurred over approximately 23 percent of the project area since the 1960s, and precommercial thinning has occurred on approximately 3 percent of the project area since the 1980s (Vegetation section).

Mountain pine beetle activity has increased foraging habitat for woodpeckers and other birds and greatly increased the availability of snag cavity nesting habitat across the project area (table 25 and figure 12). Refer to the Vegetation section for a description of the insect activity within the project area, including the mountain pine beetle, western spruce budworm and the Douglas-fir bark beetle, as well as associated tree defoliation and mortality.

The discussions of wildlife habitat below focus on vegetation types which show the greatest change, or are rare or unique. Refer to the Vegetation section for more detail on these and the more common forest types.

Quaking aspen

Aspen are of ecological importance to many species of wildlife such as elk, deer, moose, beaver, and blue grouse. In coniferous forests in the interior west, they are a source of abundant forage for browsers. In addition, they provide cooler microsites, provide cover and nesting structure, and provide a source of snags for cavity nesters.

The amount and quality of aspen cover has been declining for many years in portions of the interior West (Bartos 2001, Di Orio 1985, Rogers 2002). Aspen is second only to riparian areas in terms of biodiversity. Aspen across the Forest (and regionwide) is considered a community at risk because it is declining in patch size and vigor (USDA Forest Service 2009b). The State Comprehensive Wildlife Plan (MFWP 2005) has identified altered fire regimes in aspen galleries with resulting conifer encroachment as a conservation concern. The Forest Plan

includes an objective to increase the aspen component within lodgepole pine and other vegetation types, over 67,000 acres. Aspen distribution within the project area consists of small scattered patches, with concentrations occurring in the eastern-most portion. Aspen size classes are unspecified in the vegetation data. As noted in table 40 and table 27in the Vegetation section, aspen is a minor component within the project area.

Whitebark pine

Whitebark pine is a high-elevation tree species that has large seeds that are an important food for many species. Whitebark pine is a critical food source not only for Clark's nutcracker, but for many wildlife species including other birds, small mammals as well as bears. In particular, their seeds have several features that make them a valuable food. They are large and therefore more energetically rewarding, the nutrients are less perishable compared to other sources, and they are a rich source of dietary fat (Whitebark pine Ecology Foundation 2010).

The higher elevations around Emery Ridge and Rose Mountain in the southern portion of the project area provide these habitats. Predominant tree size in whitebark pine stands is currently from 5-15 inches d.b.h. As noted in table 40, and table 27 in the Vegetation section, this species is a minor component within the project area.

Shrubland –Grasslands

These habitats range from solid stands of grasses or grass/forbs to a mixture of sagebrush and grasses to almost solid canopy of shrubs (mostly sagebrush). Grassland and shrubland distribution within the project area is somewhat limited, with greater availability occurring at lower elevations outside the project area boundary. Lower elevation grasslands are relatively large and continuous, whereas the upper elevation habitats are interspersed with conifers and shrubs. Fire and herbivority were historically important disturbance processes in this habitat. The absence of fire and presence of increased herbivority (including livestock grazing) have influenced the distribution and seral stages of sagebrush and grasslands available for wildlife (USDA Forest Service 2009b). At present, these habitats have increased conifer cover and nonnative vegetation than were present historically.

Snags

Bush et al. (2006) analyzed snag densities based on FIA data collected from 1996-2003 for landscapes within the BDNF, prior to the onset of widespread tree mortality generated by mountain pine beetle (MPB) activity. Results from that time period for the Clark Fork-Flints Landscape show moderate availability of snags from 10-19.9 inches d.b.h. and a lack of snags equal to or greater than 20 inches d.b.h. Since that time, mountain pine beetle epidemic has been advancing through lodgepole pine, creating a large-scale disturbance and increased snag abundance. Estimates for acres affected by mountain pine beetle activity in the Flint Foothills area has increased substantially since 2006 (table 25 Vegetation section).

In addition, mortality due to western spruce budworm and Douglas-fir bark beetle in portions of the project area has increased snag availability in Douglas-fir stands. Modeled beetle activity shows that about 55 percent of the Clark Fork-Flints landscape has been affected by insect mortality (ERG 2010, table 41).

Table 41. Modeled Beetle Activity in Clark Fork-Flints Landscape (ERG 2010)

Landscape	High	Moderate	Low	Total Beetle Activity	Total Landscape Acres
Clark Fork -Flints	48,860	55,905	98,379	203,144	369,173

Since the 1960s, commercial treatments have occurred on approximately 23 percent of the project area. These areas are expected to be very low on snags; those that were left would likely have fallen by now. Dead trees may remain standing for 5-15 years. Once they have fallen, there will be less opportunity for snag recruitment in the lodgepole dominance type.
The snag direction in the Forest Plan is based on Bollenbacher et al. (2008). That analysis looked at the density and distribution of snags by various areas, habitat types, dominance groups and seral stages. That analysis also considered the potential impacts of timber harvest and human access on snag density. The actual snag retention numbers in the Plan are based on snag densities from wilderness/roadless lands on the eastside forests. The direction focuses on retention of uncommon and rare elements; large diameter standing dead trees (smaller diameter dead trees are abundant across the forest due to the MPB epidemic).

Since that analysis, Ecosystem Research Group (ERG 2010) modeled changes in vegetation and wildlife habitat as a result of the mountain pine beetle epidemic. In the Clark Fork-Flints landscape, beetle activity was present in approximately 55 percent of the total area through 2009 (ERG 2010). Within the project area, it is currently estimated that virtually all of the lodgepole pine stands greater than 5 inches d.b.h. have been affected by mountain pine beetle. Mortality due to Douglas-fir bark beetle found in the Douglas-fir stands is also occurring (see Vegetation section).

Within the Flint Foothills Project area, stand exams conducted within proposed commercial harvest units where snag numbers were recorded, indicate that availability of snags 15 inches d.b.h. varies greatly among stands, ranging from 0 – 24 per acre, with densities averaging 2.9 per acre.

Beetle-infested trees and stands

Ecosystem Research Group (ERG 2010) evaluated how changes from mountain pine beetle, other insects, disease activity and wildfire might affect habitats for nine selected species of wildlife over the next 50 years in the BDNF. The nine selected terrestrial species analyzed include: northern goshawk, fisher, black-backed woodpecker, elk, flammulated owl, pileated woodpecker, Canada lynx, wolverine and grizzly bear. They also measured how proposed vegetation treatments would affect disturbance processes and wildlife species habitats.

ERG found that vegetation changes expected from the ongoing mountain pine beetle epidemic and future modeled wildfires will be substantial. The modeled disturbance patterns and vegetation changes start from the current insect infestation and uncharacteristic vegetation conditions, and move towards a greater mosaic of vegetation patterns with more balanced and resilient characteristics. At the forest scale, there was a small but measurable difference in modeled acres burned between the treatment and no treatment scenarios for all five decades. Results indicate that treatments are the most effective near the onset of the mountain pine beetle epidemic. Modeled mountain pine beetle acreages decrease through time because of a more balanced distribution of size classes and density in the various cover types containing pine species.

Within the Clark Fork-Flints landscape, they found that habitat for the nine species would generally remain fairly static and sustainable or increase slightly in the next 50 years, except for goshawk and flammulated owl habitats, which are projected to decrease somewhat over the same time period.. This is largely because those species evolved with and are tolerant of, or dependent upon natural disturbances. The modeled changes to potential wildlife habitats are more a function of natural disturbance and succession processes and resulting changes to vegetation through time than to treatment effects. No species will become at risk due to mountain pine beetle or wildfires. Wildlife habitat does move spatially over time. Treatments can positively affect fire occurrence and benefit wildlife habitats on a project-level scale, but pale in comparison to the effects from successional and disturbance processes at the landscape scales.

Processes by which mountain pine beetle can affect wildlife habitat include: (1) beetles as a food source; (2) defoliation of tree canopy; (3) loss of bark; (4) cessation of cone production; (5) proliferation of standing dead trees; (6) fall down of dead trees; and (7) increased production of understory vegetation (Chan-McLeod 2006).
Table 42 summarizes some of the effects of these changes.

Table 42. Changes in habitat features over time

Stage	Effects
Beetles as a food source	Several species of woodpeckers take advantage of beetle numbers. An individual tree serves as a food source for about a year. Continued foraging habitat for woodpeckers depend on spread of beetles throughout the stand.
Defoliation of tree canopy	Foliage usually changes from green to yellow to red within 3 years after attack and trees begin to lose needles 2-4 years after death. Complete defoliation occurs approximately 3-5 years after death. Loss of needles for forage (hare, grouse), loss of habitat for invertebrates (prey for foliage-gleaning birds), loss of resting and nesting habitat in canopy (small mammals, birds.
Loss of bark	Loss of cambium used by porcupines, substrate for invertebrates (prey for trunk-foraging species such as nuthatches), loss of roosting habitat for bats.
Cessation of cone production	Species such as crossbills and squirrels lose food source
Proliferation of standing dead trees	The sudden proliferation of lodgepole pine snags will not have the same value as the intermittent creation of snags due to lack of interspersion with live green canopy. In addition, there are limitations based on the small size of lodgepole pine, which will not remain standing as long as larger diameter snags.
Falling down of dead trees	The rate at which snags fall varies from area to area, but generally most snags are down within 5-15 years. Increased use as avian perches and small mammal cover.
Enhanced understory production	Increased sunlight allows increased understory grass, forb and shrub production.

These processes will be analyzed for specific species that are associated with those features. Factors affecting the nature of effects include 1) time since death; 2) residual green component; 3) ecosystem types; and 4) landscape effects. These factors are also considered in the species-specific analyses.

Old Growth

Old growth forests are distinguished by old trees and structural characteristics developed over time (Green et al. 1992, errata corrected 2007, 2008). An analysis of old growth over large landscapes was completed by Bush et al. (2006). In the Clark Fork-Flints landscape, the

analysis estimated that 20.9 percent of the Forest is in old growth with a 90 percent confidence interval of 14.1-28.1 percent. Estimates for percentage of old growth in the landscape were highest in spruce/fir associations (43.3 percent, lowest in Douglas-fir/ponderosa pine types (10 percent) and moderate in lodgepole and whitebark pine (20 percent). No old growth mapping was completed specific to Flint Foothill Project area beyond the formal stand exam surveys and informal surveys that were conducted in each proposed unit (Vegetation section). Inventoried old growth is limited to 281 acres within the project area. Treatment noted in the Vegetation Analysis indicates minimum criteria per Green at al. (2007) would still be met.

Connectivity

The Forest Plan includes a goal that the Forest would contribute to wildlife linkages between landscapes, unless isolation is determined to be beneficial. Linkage areas are those areas identified for large carnivores and ungulates through multi-agency cooperation. Options may include, but are not limited to: maintaining Forest Service ownership at highway and road crossings; consolidating ownership at approach areas to highway and road crossings substantiated by empirical data as necessary to facilitate wildlife movement; and provide secure habitat at the landscape scale to facilitate large animal movement.

Linkage areas for Canada lynx were identified for the Northern Rockies Planning Area (USDA Forest Service 2007). Linkages mapped through the Clark Fork-Flints landscape include one between Georgetown Lake and Anaconda connecting the southern and central portions of the landscape across State Highway 1, and one connecting the central portion of the landscape to portions in the John Long Mountains, across State Highway 1 (USDA Forest Service 2007). These linkages are estimates and not substantiated by empirical data on lynx movement. The Beaverhead-Deerlodge National Forest is classified as unoccupied by Canada lynx (USDA Forest Service 2007). The species absence is supported by the periodic species lists issued by the US Fish and Wildlife Service (USDI Fish and Wildlife Service 05/09/2012).

Desired Condition

The Forest Plan provides Forestwide (Forest Plan, p. 11) goals and site-specific goals, objectives and standards and guidelines for maintenance of wildlife habitat (Forest Plan, pp. 43-49).

Regulatory Framework

Applicable requirements and other direction guiding the management and protection of wildlife and habitat may be found in the Endangered Species Act (ESA), National Forest Management Act (NFMA), and USDA Forest Service manuals. The Forest Plan was developed to be consistent with ESA, NFMA, and manual direction. Details are provided in the wildlife report in the project file.

Environmental Consequences

Methodology

Pre-field reviews were conducted to determine which species are known to occur in the area or have suitable habitat present and could potentially occur. Sources reviewed include Montana Natural Heritage Program (MNHP), Forest occurrence information, Plan FEIS Appendix B (Biological Evaluation) and species distribution information.

Surveys completed in the project area (appendix F) include northern goshawk, flammulated owl, great gray owl, and woodpecker. Units were prioritized for surveys based on potential for habitat for specific species and are discussed further in species-specific analyses.

There are several types of activities proposed in this project. Not all types of activities have the potential to affect each species because each species has specific habitat requirements. This is addressed for each species.

The action alternatives propose similar treatments with variation in the amount of commercial thinning and salvage, as well as transportation components. The exception in similarity is the proposed treatment in old-growth stands under alternative 2 and lack of treatment of old growth under alternative 3. Due to the similarities, alternatives 2 and 3 are analyzed concurrently to compare and contrast effects to species. Any notable distinctions between the effects of the alternatives are identified.

Diversity Analysis

To meet the requirements of NFMA implementation regulations, the focus is for the Forest Service to assess habitat to provide for a diversity of species. NFMA direction is to"…provide for a diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple use objectives." In addition, it includes direction to consider the best available information in implementing the Plan. The Northern Region uses a principle-based approach to population viability analysis (PVA) that is widely agreed to and supported in peer-reviewed, scientific literature (summarized in Samson 2006). Samson 2006 is incorporated by reference.

Samson (2006) conducted a regionwide conservation assessment for the northern goshawk, black-backed woodpecker, pileated woodpecker, and flammulated owl, which is founded on a principle-based approach to PVA. To assess the availability of suitable habitat and ultimately assess short- and long-term viability on each Forest in the Northern Region, Samson used peer-reviewed science, all known inventory/observation data, vegetation data from Forest Inventory and Analysis (FIA), scientific information on the minimum dispersal distances for species, their home range and body sizes, and well known conservation principles for each species. In summary, based on that analysis, habitat for each of these species is abundant and widely distributed. Bush and Lundberg (2008) updated and substantiated Samson (2006) findings. The result was generally an increase in habitat for all species except pileated woodpecker.

The Biological Evaluation and Biological Assessments/Opinions for the Forest Plan revision also assessed viability for threatened, endangered and sensitive (TES) species on the BDNF (USDA Forest Service 2009b, Appendix B).

Most recently, Ecosystem Research Group (2010) analyzed vegetation changes due to mountain pine beetle across the Forest. They also looked at the effect this would have on habitat for nine selected wildlife species over the next 50 years. This new information has been incorporated into the analysis.

For this project, the above references, as well as available population status and distribution information; occurrence records from survey efforts; hunting and trapping data; and the scientific literature for information on the biological and habitat requirements for species, as well as species response to disturbance were reviewed. This analysis is tiered to the Forest Plan viability analysis.

Spatial and Temporal Context for Effects Analysis

The analysis area used for direct, indirect and cumulative effects is limited to the project area for most species. The project area boundary encompasses the affected areas where the proposed treatments would be located, and is large enough in scale to include one or more home ranges of most wildlife species in the area. Where open, motorized, road and trail densities (ORMTDs) are the basis for the effects analysis, the analysis areas to assess ORMTDs are landscapes and hunting units, consistent with Forest Plan direction (Forest Plan, Tables 13 and 14). Analysis for lynx is based on Lynx Analysis Units (LAU), which have been mapped Forestwide.

Generally, short-term effects are associated with disturbance from activities, and immediate changes to habitat after treatment. Long-term effects will consider changes to potential habitat over time, dependent on specific species habitat needs. Measures for changes in habitat will be acres of treatments compared to the amount of suitable habitat available (by species).

Part of the analysis focuses on changes in vegetation, as this proposal would result in changes to stand structure and species composition through salvage, thinning, precommercial thinning, and prescribed burning. Some species may be favored by some treatments and unaffected by others, dependent on habitat preferences. For example, flammulated owls may benefit from thinning in Douglas-fir, and be unaffected by salvage of lodgepole pine.

The analysis also includes disturbance effects due to increased traffic, human activity, and equipment use during project activities. Several species or groups of species are potentially affected by disturbance: wolves, wolverines, elk, and nesting raptors, dependent on the seasonal timing of activities. Timeframes for project activities vary by type of activity. For example, the commercial harvest units (salvage of lodgepole pine and thinning of Douglas-fir) are expected to take a maximum of 5 years, while precommercial thinning, prescribed burning, and other post-treatment activities may take up to 10 years.

Past, Present, and Foreseeable Future Activities Relevant to Cumulative Effects Analysis

Past actions that have affected vegetation include fire suppression, timber harvest, prescribed burning, livestock grazing, and firewood cutting. These past actions have contributed to the existing vegetation and habitat conditions.

Harvest increased greatly from the 1960s through the mid-1980s and has declined in recent years. Commercial timber harvest has occurred on about 23 percent of the project area, while non-commercial thinning has occurred on about 3 percent of the project area. Roadside salvage has occurred in the project area as well. Harvest has occurred on approximately 237 acres of private land within the project area boundary. Prescribed fire (burning of logging slash, understory burns, and burns to remove conifer succession in grass-shrub habitats) has occurred on about 11 percent of the project area (see the Vegetation Report in the project record).

Table 24 at the beginning of chapter 3 discloses the present and reasonably foreseeable actions within the project area that are relevant to this DEIS analysis. Present and reasonably foreseeable activities that may affect species or habitats discussed in this analysis include: public activities such as recreational activities, wildlife viewing or driving for pleasure; activities requiring fees or permits such as cabin rentals or firewood permits; trail maintenance, the Forest travel analysis to designate motorized use; livestock grazing; ongoing invasive plants control; Roadside #4 Salvage Hazard Tree Removal; wildland fire suppression; Emery 21 Timber Sale; Montana State Prison lands future timber harvest (outside of the project

boundary); Montana DNRC lands potential future timber harvest (outside of project area); BLM lands prescribed fire treatments and ongoing livestock grazing (outside of project area); and timber harvest on private inholdings.

Climate Change

Changes in climate may affect the amount, quality and distribution of broad-scale vegetation types or may impact forest structure and various successional stages associated with drought, insects, diseases or fire (see Vegetation section). As a driver of biotic systems, climate affects individual fitness; population dynamics; species abundance and distribution; and ecosystem composition, structure, and function. Wildlife can respond in three ways; they can respond in place through genetic, physiological or behavioral adaptations; they can move to a new location (distributional shifts) or they may be unable to do either and be unable to reproduce successfully and may face local extirpation or extinction.

There are numerous sources of uncertainty when trying to predict the effect of climate change. A few include variability in physical systems; uncertainty in vegetative community shifts; interactions between climate and non-climate stressors; and variation in species life history strategies, physiological tolerance and dispersal abilities (Hahn 2009). Climate change is addressed as a cumulative effect for species in this analysis where applicable.

Overview

Effects to species will be analyzed by looking at changes in habitats, as well as considering disturbance associated with the activities. Vegetation management activities may affect stand age, structure or species composition, thereby affecting habitat. Actions with potential for direct effects on habitat include salvage, commercial thinning in Douglas-fir, seed tree harvest, prescribed burning within and outside timber harvest units, and precommercial thinning. Indirect effects after project implementation include changes in vegetation structure over time.

Wildlife habitat attributes and availability of habitat components largely determine area suitability for species. Several components and attributes, including wildlife secure areas, snag retention, old growth availability, and connectivity/fragmentation, are applicable to effects analysis for a number of species addressed in this analysis. Therefore, effects to those elements are summarized in the following sections and referenced under individual species analysis.

Roads and Wildlife Security Areas

Roads are recognized as having impacts on many species of wildlife. Effects range from direct mortality, creation of edge effects, barriers to movement for some species, and disturbance and displacement (Forman and Alexander 1998; Trombulak and Frissell 2000).

Security is important for a range of mammals, including elk, bears, wolverines, and lynx. Habitat effectiveness for elk decreases as road densities increase. Increasing access and use of an area causes increasing conflicts and risks to wildlife resources that can be displayed in four broad categories: habitat alteration, disturbance, increased vulnerability to mortality, and increased invasive plant species establishment.

In the Forest Plan for wildlife secure areas and connectivity, direction is to manage density of open, motorized roads and trails by landscape year-round (except fall big game hunting season) to achieve levels at or below the levels shown in table 43. Currently, the open, motorized road and trail density (OMRTD) in the Clark Fork-Flints landscape is below the maximum level described in the Forest Plan.

Table 43. Clark Fork-Flints Landscape Goal for open, motorized road and trail densities (OMRTD

Landscape	Maximum Forest Plan OMRTD	Existing OMRTD Percent Secure Area
Clark Fork-Flints	1.9 miles/square mile	1.8 miles/square mile 40.1 % secure area

These secure areas, defined as areas greater than 10 acres regardless of vegetative components and more than 0.33 mile from an open road, are based on areas outside of the influence of open motorized roads and trails. Currently, 19 percent of National Forest System (NFS) lands within the project area provide summer wildlife-secure areas. In addition, the Forest Plan identified areas for winter nonmotorized recreation. In the Flint Foothills Project area 12 percent of the NFS lands managed by the BDNF are managed as winter nonmotorized. These areas are located within and adjacent to mapped big game winter ranges (figure 35).

Elk security is provided by secure areas (defined above) during the fall hunting season. The Forest Plan includes direction to manage OMRTD by hunting unit, to achieve levels at or below the maximum level shown in table 44 for Hunting Unit 212. Currently, Hunting Unit 212 is slightly under the OMRTD maximum level for the general hunting season (table 44). About 42 percent of NFS lands (15,415 acres) within the project area provide fall elk-secure areas. Distribution of both summer and fall wildlife security areas is shown in figure 26.

Table 44. Hunting unit 212 (fall) maximum and existing OMRTD

Hunting Unit	Maximum Forest Plan OMRTD	Existing OMRTD Percent Secure Area
212	1.4 miles/square mile	1.3 miles/square mile 49.8% secure area

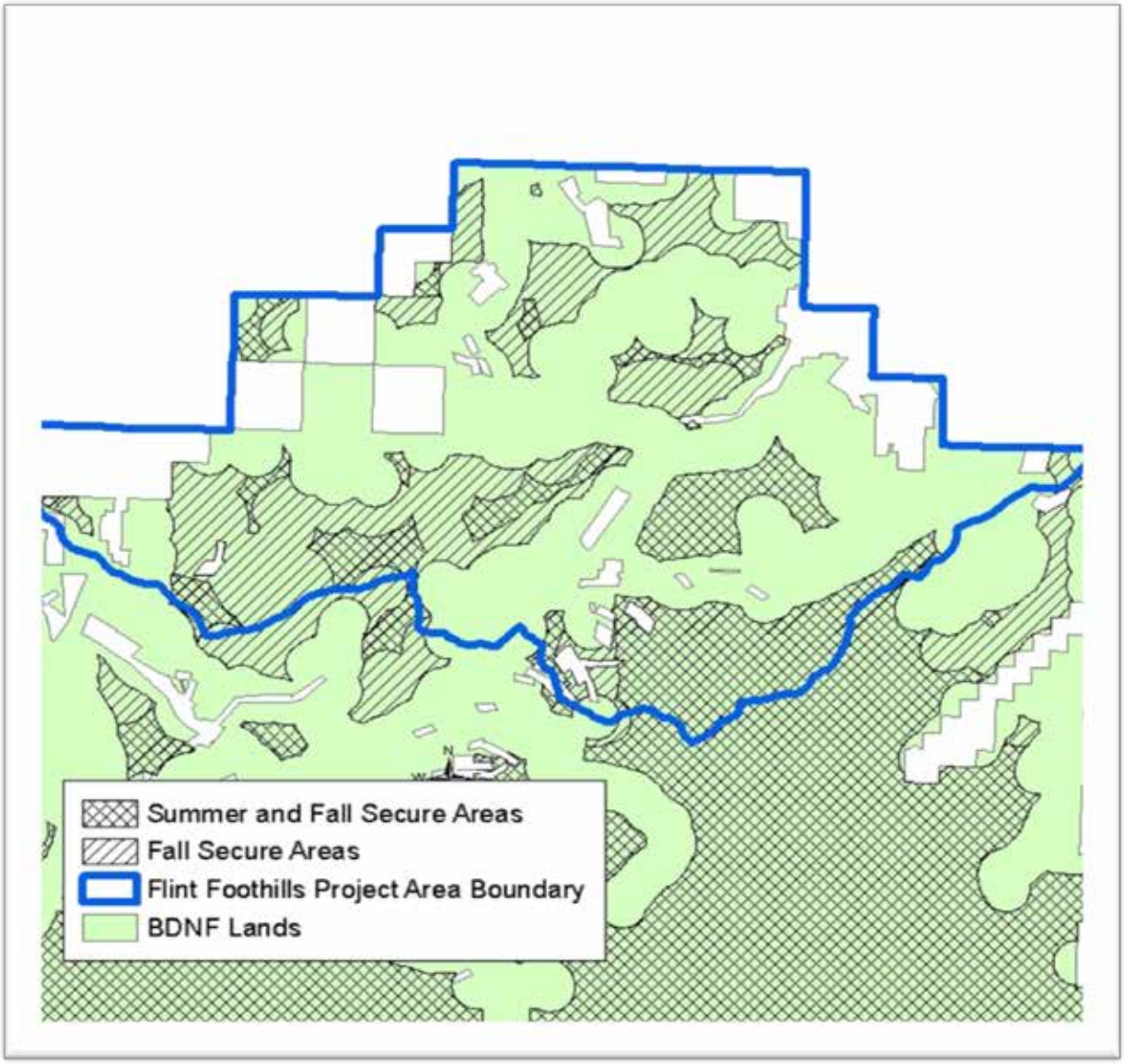


Figure 26. Summer and fall elk secure areas, BDNF lands

Alternative 1- No Action

Direct, Indirect, and Cumulative Impacts

For alternative 1, there would be no direct, indirect or cumulative effects to species analyzed for the Flint Foothills Vegetation Management Project because no project activities are proposed.

Alternatives 2 and 3

Direct and Indirect Effects

Road Treatments and OMRTD

Road treatments under alternative 2 include construction of approximately 1.3 miles of new National Forest System (NFS) road that would be managed as closed to motor vehicle use after project activities are completed. Approximately 7.2 miles of new temporary road would be constructed and subsequently decommissioned by upon completion of project activities. New road NFS and temporary road construction totals 8.5 miles. On existing routes, approximately 0.6 mile of existing open unauthorized route and 0.4 mile of closed unauthorized route (about 1.0 mile total) would be reconstructed for timber haul and added to the Forest transportation system as maintenance level 2. A total of 4.4 miles of other reconstructed unauthorized roads (1.0 mile of open and 3.4 miles of closed) would be used as temporary roads for timber haul and subsequently decommissioned. Overall, alternative 2 would create a 0.6-mile reduction of roads open to motor vehicle use; a total reduction of 3.1 miles of road would occur.

Under alternative 3 only existing roads would be used for timber haul. No new or temporary road construction outside of existing routes would occur. This alternative would reconstruct 1.0 mile of existing unauthorized road for timber haul and subsequent inclusion in the Forest System, similar to alternative 2. After vegetation treatments, 2.3 miles of existing unauthorized roads would be decommissioned by obliteration. There would be no change in mileage available for motor vehicles, and a total reduction of 2.3 miles of road in the project area following treatments.

Roads within the project area are unpaved and narrow, vehicle speeds are generally low, and vegetative cover is common along travel routes. The wildlife species analyzed here are highly mobile, therefore, the potential for barriers to movement and edge effects are minimal. Road reconstruction and reconditioning associated with this proposal are not expected to increase potential for direct mortality or create barriers to movement on these existing roads for these same reasons listed above.

Table 45 summarizes road treatments and resulting OMRTDs by alternative for the summer and fall periods, respectively. During project activities, vehicle and equipment use of newly constructed roads (temporary and System road) and use of URs (existing temporary roads) for management activities would occur, thereby increasing disturbance temporarily. These roads would be closed to public motorized access during implementation. Use of all new and temporary roads for project implementation is not expected to occur simultaneously. Management activities would be distributed in space and time throughout the project area and roads would be obliterated or closed upon completion of activities associated with that road. In addition, most of the project area is in an October 15 – December 2 area restriction, where motorized use occurs only on designated routes during the hunting season. Although alternative

2 would reduce open roads by 0.6 mile, OMRTDs under both alternatives at the landscape and hunting unit scale would remain essentially unchanged after project completion.

Table 45. Pre- and post-treatments summer OMRTD in Clark Fork-Flints landscape, and fall OMRTD for Hunting Unit 212 (Alt 3 in parentheses)

Area	Existing OMRTD	Miles of New Temporary Road	Miles of Opened Road, Currently Closed	Miles of New Construction System Road	OMRTD During Project	OMRTD Post-Project
Clark Fork-Flints Landscape	1.78	7.2 (0)	3.8 (2.3)	1.3 (0)	1.80 (1.78)	1.78 (1.78)
Hunting Unit 212	1.25	7.2 (0)	3.8 (2.3)	1.3 (0)	1.3 (1.26)	1.25 (1.25)

Wildlife Security

After project implementation, 19 percent of the project area would provide summer wildlife secure areas, and 41 percent of the project area would provide fall wildlife security. This is unchanged from the existing condition.

The road work (maintenance, reconstruction, construction) and associated timber sale activities would be implemented over five years. During project implementation, existing travel restrictions would be followed with exceptions where roads are currently closed year-round. Roads closed year-round include roads 19752, 78472, and 78476 that access units 44S, 58S, and 69S under both action alternatives. Use of these roads for project implementation during the summer season would increase disturbance on 462 acres of existing summer security habitat under both action alternatives. All units accessed or located in fall secure areas would be restricted during that period under both action alternatives (Wildlife project design features and mitigation measures, chapter 2.).

Under alternative 2, new temporary roads that would access units 48C, 55C, 56C, 57C, 68C, and 71C are located inside or within 0.33 mile of existing summer security habitat. Use of these roads in the summer season during implementation would produce short-term disturbance on approximately 354 acres of summer security habitat. New NFS road construction designed to access units 36S and 47S would produce short-term disturbance on an additional 72 acres of summer secure habitat during implementation. Total area of summer security habitat affected by short-term disturbance is about 816 acres for alternative 2.

For alternative 3, no short-term disturbance would occur in summer security habitat as a result of new temporary roads or new NFS road construction. Total area of summer security habitat affected by short-term disturbance is about 462 acres for alternative 3.

Table 9 for alternative 2, and table 12 for alternative 3, display those units that are located in fall wildlife secure areas or have haul routes that are affected by the fall area restriction.

Cumulative Effects

Cumulative effects for OMRTDs and wildlife security areas are addressed where applicable under individual species analyses in this document.

Snag Availability

Alternative 1- No Action

Direct, Indirect, and Cumulative Effects

Under alternative 1, there would be no direct, indirect, or cumulative effect on snag resources because no project activities are proposed.

Alternatives 2 and 3

Direct, Indirect Effects

Within the Flint Foothills project area, stand exams that recorded snag numbers in 10 stands proposed for salvage by clearcut treatment indicated that availability of snags 15 inches d.b.h. or larger varies greatly among stands, ranging from 0 – 24 per acre, with densities averaging 2.9 per acre within lodgepole pine stands proposed for treatment. A small proportion of the project area (106 acres) is classified as stands averaging more than 15 inches d.b.h.; therefore, the vast majority of larger snags within the project area would come from larger size classes within mature stands averaging 10-14 inches d.b.h.

In medium and larger size classes (10 inches+ d.b.h.) of Douglas-fir/ponderosa pine, alternative 2 would treat 13.4 percent of existing medium and larger size classes; alternative 3 would treat 9.1 percent of existing medium and larger size classes. In lodgepole pine stands 5 inches + d.b.h., alternative 2 would treat 7 percent, while alternative 3 would treat 6.2 percent of existing medium and larger size classes. Size classes of snags removed in treatment units range from 4 to 20 inches d.b.h. Under alternatives 2 and 3, respectively, the remaining 87 – 91 percent of the Douglas-fir and 93 – 94 percent of the lodgepole pine left untreated would continue to provide snags and snag recruitment created by natural processes (drought, insect and disease, etc.).

Within the commercial treatment units, trees would be retained at numbers prescribed by the Forest Plan standard 3(table 46). Snags retained in treatment units would be clumped to reduce both the potential for windthrow and for safety reasons, as well as to increase suitability for wildlife (wildlife project design features and mitigation measures, chapter 2). Forest Plan Wildlife Standard 4 (Forest Plan, p. 48) would also be met through the retention of all live conifer trees other than lodgepole pine with the salvage treatment type (see Flint Foothills Project Vegetation Report in the project file).

Table 46. Minimum average snags per acre to be retained, calculated for the total treatment unit acreage in a project area (BDNF Forest Plan, Table 12).

Vegetation Category	Minimum average snags per acre to retain
	Snags Greater Than 15.0 inches d.b.h.
Warm	3.6
Cool	8.0
Cold	5.0
PICO	6.4

Forest Plan snag direction was based on existing snag densities in wilderness/roadless (unmanaged) areas in eastside forests which are similar to conditions under which species evolved. Currently, there are widespread snags outside of treatment areas. Snags available in untreated areas, in addition to larger snags retained within treatment units, ensure that both action alternatives would maintain habitat for cavity nesting species across the project area.

The successional stage of the surrounding plant community influences the way wildlife use snags; therefore, utilization of snags retained within treatment units will vary by wildlife species. Some species, like bluebirds, house wrens and olive-sided flycatchers will use cavities in a snag that occurs in the grass-forb stage or shrub-seedling state and will not ordinarily use the snag if it is surrounded by more advanced successional stages. Other species, such as the pileated woodpecker, hairy woodpecker, and northern three-toed woodpecker nest in a snag surrounded by trees and tend to avoid nesting in snags in earlier successional stages (Thomas 1979). While all cavity-nesting species may not use the snags that are retained in the units for nesting, existing cavities in retained trees would be used by other secondary cavity nester species that prefer snags in open areas.

Commercial thinning treatments would decrease stand densities, thereby accelerating future tree growth. This would also reduce the potential for tree mortality due to insects and disease, wildfire, and growth suppression. While total snag numbers generated in a stand that has been thinned may be less than in a stand that has not been thinned, snags in the thinned stand are more likely to be larger and therefore more functional to a wider range of species.

Cumulative Effects

Cumulative effects for snag resources are addressed where applicable under individual species analyses in this document.

Large Openings

There are 12 salvage harvest units and 3 seed tree harvest units over 40 acres proposed under alternative 2. A total of 11 salvage units and 3 seed tree units larger than 40 acres are proposed under alternative 3. The wildlife species analyzed here are mobile; therefore, these openings may alter species movements locally (i.e., at the stand level), but units are not expected to affect movements at the landscape level. In the long term, these large units would have less downed wood in the form of jackstrawed trees on the ground (as compared to unsalvaged lodgepole pine stands), thereby potentially enhancing mobility for some large species such as elk, but the lack of dense downed log accumulations within treatment units would reduce stand-level suitability for species such as fisher.

Wildlife Species Considered

Species considered in this analysis include terrestrial species listed as federally threatened, endangered, candidate or experimental/non-essential on the Beaverhead-Deerlodge National Forest, and Forest Service Northern Region’s sensitive species list; listed for the BDNF and hereafter called TES. In addition, management indicator species (MIS) designated in the Forest Plan are addressed. Lastly, several other species, or groups of species are addressed as other species of interest.

Threatened and Endangered Species

Regulatory Framework

The Endangered Species Act of 1973 requires federal agencies to ensure that any agency actions (any action authorized, funded or carried out by the agency) are not likely to jeopardize the continued existence of any threatened, endangered or proposed species.

Species List

The only federally listed terrestrial wildlife species for the Beaverhead-Deerlodge is the grizzly bear (threatened). The yellow-billed cuckoo, wolverine, and greater sage grouse are classified as candidate species (USDI Fish and Wildlife Service 2012). Candidate species are not subject to any of the substantive or procedural provisions of the Endangered Species Act.

The grizzly bear is known to occur on the Madison Ranger District in the Greater Yellowstone Ecosystem. Clark Fork-Flints landscape lies outside the grizzly bear Yellowstone Distinct Population Segment (DPS). There have been recent sightings on the north end of the Forest, and grizzly bears are addressed here.

The yellow-billed cuckoo uses cottonwood-willow riparian habitats west of the Continental Divide. The species is not known to occur in Granite or Powell counties. The project area is outside of the known distribution of this species and contains no suitable habitat. There is no further analysis for this species.

The entirety of the Deerlodge portion of the BDNF, which encompasses the project area, has no sage grouse leks. The project area is located more than 60 miles north of the nearest known active sage grouse lek site and contains little or no suitable sage grouse habitat.

In December 2010, the FWS announced a 12-month finding on a petition to list the North American wolverine under the Endangered Species Act. After review, they found that wolverines occurring in the contiguous United States are a distinct population segment and listing may be warranted, but precluded, making them a candidate species. As the Forest Species list (USDI Fish and Wildlife Service 2012) states, none of the substantive or procedural provisions of the Act apply to candidate species but they encourage consideration in environmental planning. Wolverines are addressed in this analysis both as a sensitive species and as a management indicator species.

Grizzly Bears

Overall Population and Habitat Status and Distribution

The historic range of the grizzly bear (*Ursus arctos horribilis*) in the contiguous 48 States extended from the central Great Plains, west to California, and south to Texas and Mexico. Between 1800 and 1975, grizzly bear populations in the lower 48 states declined from over 50,000 to less than 1,000. As European settlement expanded westward, the grizzly was extirpated from most of its historical range.

Five areas in the lower 48 states currently support grizzly bear populations; these areas are located in Montana, Wyoming, Idaho, and Washington and include: the Yellowstone Ecosystem, Northern Continental Divide Ecosystem (NCDE), Cabinet-Yaak Ecosystem, Selkirk Ecosystem, and Northern Cascades Ecosystem. These areas represent less than two percent of the grizzly’s former range (USDI Fish and Wildlife Service 1993).

Biological Information for Grizzly Bears

Grizzly bears excavate dens as early as September or prior to entry in November. Dens are usually dug on steep slopes where wind and topography cause an accumulation of deep snow and where snow is unlikely to melt during warm periods. Dens are generally found at high elevations well away from human activity and development (USDI Fish and Wildlife Service 1993).

Grizzly bears are opportunistic feeders and will prey or scavenge on almost any available food. Plants with high crude protein content and animal matter are important food items. The search for food has a prime influence on grizzly bear movements. Upon emergence from the den grizzlies move to lower elevations, drainage bottoms, avalanche chutes, and ungulate winter ranges where their food requirements can be met. Throughout spring and early summer grizzlies follow plant phenology back to higher elevations. In late summer and fall, there is a transition to fruit and nut sources, as well as herbaceous materials. This is a general pattern; however, bears will go where they can meet their food requirements (USDI Fish and Wildlife Service 1993).

Home ranges of adult bears may overlap. The home ranges of adult male grizzlies are generally two to four times larger than adult females. The home ranges of females are smaller while they have cubs, but increase when the cubs become yearlings. Mace and Roberts (2011) reported that female grizzly home ranges in the NCDE were smallest for females with cubs of the year (avg. = 40 mi^2) and largest for subadults (avg. = 93 mi^2). Home ranges vary in relation to food availability, weather conditions, and interactions with other bears.

Grizzly Bear Habitat and Use of the Analysis Area

The Flint Foothills project area lies between the Greater Yellowstone Area (GYA) and Northern Continental Divide Ecosystems (NCDE) for grizzly bears as shown in figure 27. The project area is approximately 30 miles south of the NCDE recovery zone and about 9 miles south of mapped grizzly bear distribution.

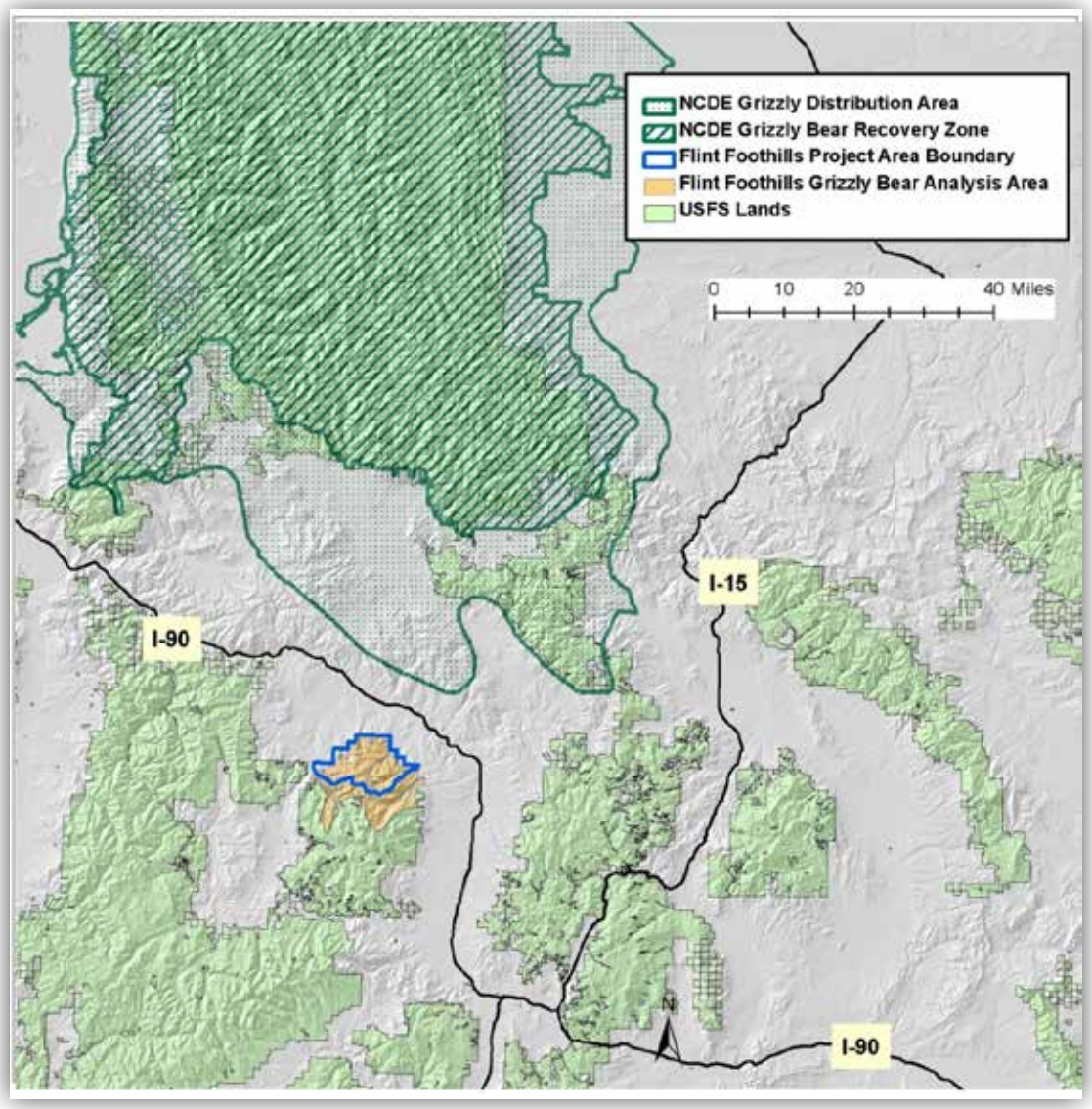


Figure 27.Grizzly bear recovery zones and distribution areas in regards to the project area

The Gravelly Landscape (on the Madison Ranger District) encompasses the only known consistently occupied area on the Forest and is located approximately 97 miles southwest of the project area. However, grizzly bears have been documented in other areas of the Forest in closer proximity to the Flint Foothills Project area. In recent years, several grizzlies have been detected in these areas. In the late 1990s, several grizzly bear tracks were documented in the Flint Creek mountain range. In 2002, a grizzly was videotaped while feeding on two moose carcasses in the John Long Mountains about 15 miles west of the project area. In 2005, an adult male grizzly was found dead on the east end of the Anaconda range, and in 2008, a young male grizzly was captured near Drummond, which is about 8.5 miles north of the project area (Jonkel and Edge 2009).

More recently, a male grizzly bear was killed on the south end of Elk Park in June 2010, (about 3.5 miles southeast of the project area), and a female with yearling were seen in the Anaconda-Pintler Wilderness in September 2010 (about 36 miles south of the project area), (Mace and Roberts 2011). In 2011, a confirmed grizzly bear track was identified on BDNF lands west of Philipsburg (more than 15 miles southwest of the project area). In April, 2012 a grizzly bear was sighted on the BDNF east of Deer Lodge (about 24 miles east of the project area). All of these sightings appear to represent transient bears with established residency yet to be corroborated by U.S. Fish and Wildlife Service updates in grizzly bear distribution. These detections indicate that bears from the NCDE are dispersing towards the northwest portions of the Pintler RD, and it would be reasonable to conclude that a grizzly bear could traverse the project during the implementation period.

The area between John Long Mountains, Flint Creek range and the Pintler range is described as having the capability of becoming a key grizzly linkage zone between the Boulder/Garnet mountain range complex and the Anaconda-Pintler Wilderness (Jonkel and Edge 2009). The Forest Plan road density goals and objectives provide secure habitat and areas of connectivity that can provide for large ungulates and forest carnivores, including the grizzly bear.

Environmental Consequences

Basis for Effects Analysis

The assessment of potential effects to grizzly bears is described in terms of those parameters that threaten grizzly bears either through human contact and conflict or through reductions in secure habitat. More specifically, parameters that address grizzly/human conflict (e.g. access management, appropriate food storage, and livestock) and vegetation management form the basis against which threats to grizzly bears are measured.

Access Management

Grizzly bear habitat across the region is best described in terms of the availability of large tracts of relatively undisturbed land that provides some level of security from human depredation and competitive use of habitat by humans (including roading, logging, grazing, and recreation) (USDI Fish and Wildlife Service 1993). To that end, secure habitat as defined in the forest plan is a useful metric to assess the extent of habitat security for grizzly bears. The definition of secure habitat as a 10-acre polygon more than 0.33 mile from an open motorized road is a slightly modified version of that used in the Yellowstone Grizzly Bear Conservation Strategy in that the 0.33-mile buffer presents a more conservative assessment of secure habitat than the 500-meter buffer used in the conservation strategy.

Many studies have found that grizzly bears will generally avoid areas with open roads. Mace and Manley (1993) found that adult grizzly bears used habitat with open road densities greater than 1 mi/mi2 less than expected. All sex and age classes of grizzly bears used habitat with total road densities greater than 2 mi/mi^2 less than expected. Grizzly bears generally adjust to disturbance associated with roads by avoiding the area that in turn results in a reduction in the amount of habitat available to the bears. Roads also provide increased access into previously remote areas that in turn encourages human settlement, recreational use, and other land uses. These activities can increase the frequency of human-bear confrontations and ultimately reduce habitat availability and grizzly populations.

Seasonal habitat use by grizzly bears is also an important consideration in access management. When bears emerge from the den, they tend to search for food in lower elevations, drainage

bottoms, avalanche chutes, and ungulate winter ranges (USDI Fish and Wildlife Service 1993). Throughout the late spring and early summer they move towards higher elevations as food becomes available. Because spring habitat tends to be at lower elevations, increased potential exists for conflict between bears and humans due to greater access into those areas by humans. Roads located in riparian zones, for example, may result in indirect habitat losses through avoidance behavior by bears. Riparian zones are heavily used by grizzlies for feeding and travel corridors (Moss and LeFrance 1987). During fall, female bears use mid- and high-elevation habitats and strongly avoid high densities of high-volume roads suggesting that seasonal road closures aimed at minimizing traffic in important seasonal habitats may benefit grizzly bears (Mace et al. 1999).

Food Storage

Availability of human-related foods can attract bears and cause changes in bear behavior leading to habituated and/or food-conditioned bears. Human food, livestock feed, and garbage all increase the opportunity for grizzly/human conflicts. Oftentimes, habituated or food-conditioned bears are removed or killed.

Livestock Grazing

Interactions between livestock and grizzly bears have historically led to the removal of grizzly bears. In several studies, livestock depredation was a leading cause for which a bear was removed and in several instances livestock depredation became a leading cause of nonhunting mortality (Thier and Sizemore 1981, Knight and Judd 1983, Knight et al. 1985, Aune and Stivers 1983). Most livestock depredations have involved sheep (Lee and Weaver 1981, Knight and Judd 1983); however, grizzly bear removals and mortality due to cattle depredation have been reported.

Grizzlies also feed on livestock carcasses (Servheen et al. 1981, Aune and Stivers 1983). Livestock carcasses may be scattered or deposited in ‘boneyards.’ Improperly situated boneyards may function like garbage dumps, attracting bears to these areas, and increasing human/bear conflicts.

Vegetation Management

Timber Management - Many studies have documented that grizzly bears avoid logged areas, while other studies indicate no changes in grizzly populations as logging pressure increased (Lyon and Basile 1980, Mace and Jonkel 1980). Despite conflicting results as to whether grizzly bear numbers are affected by logging, it appears that their behavior is modified. Timber harvest can affect the quality of grizzly bear food and cover causing bears to modify their use of that area. Timber harvest can also affect grizzly bear habitat by increasing human access into an area.

Bear flight response was stronger to ground-based human activities, such as people on foot or moving vehicles, when in the open than when in cover (McLelland and Schackleton 1989). However, the secure area definition for the Yellowstone Grizzly Bear Conservation Strategy (2003) does not include any vegetation criteria.

In the Yellowstone area, grizzly bears use of lodgepole pine forest varied widely by season, year, and structural condition (McLelland and Schackleton 1989). Recently disturbed open sites were used mainly for travel and avoided for bedding, while foraging activities in other structural types included excavation and consumption of invertebrates (mostly ants), grazing on grasses and forbs, consumption of ungulates, and consumption of whitebark pine nuts. In the

Flathead River drainage of British Columbia and Montana, regenerating forest cut-blocks (age less than 40 years since harvest) were the habitat type least-selected by bears during summer and fall seasons (McLelland and Hovey 2001).

Fire Management

Management practices that encouraged fire suppression have altered the natural succession of many forests and have resulted, in many cases, in a reduction or elimination of early successional stages. This has had a negative impact on grizzly bear food production (Martin 1983, Holland 1986). Low intensity prescribed fire in grizzly bear habitat can be beneficial to maintaining whitebark pine (USDI Fish and Wildlife Service 2011c).

Spatial and Temporal Bounds

The spatial and temporal bounds for the environmental baseline and effect analysis can be found in figure 28. This analysis area is approximately 73,931 acres (299 mi^2) on BDNF lands and includes the FS portions of the Flint Foothills project area and adjacent 6th-level watersheds (HUCs).

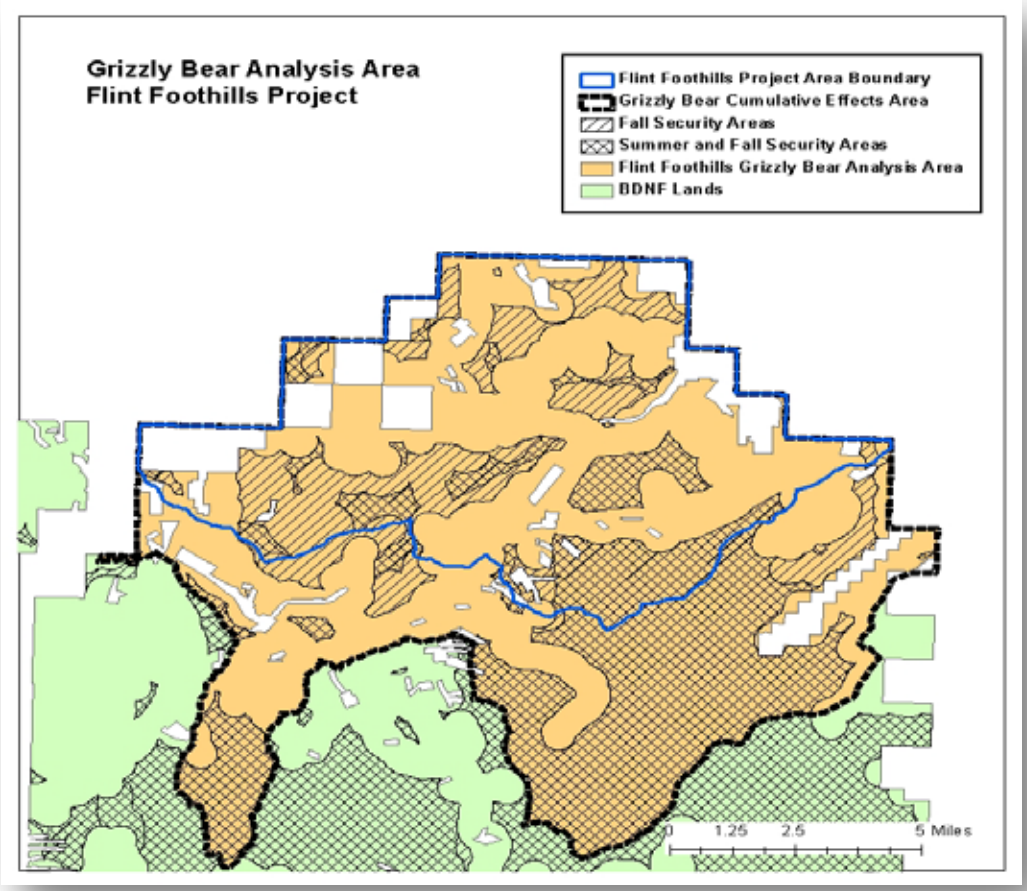


Figure 28. Existing security areas, Flint Foothills grizzly bear analysis area

It was delineated because the sufficient size to account for the average size of a female grizzly bear's home range (205-294 sq. km) more than encompasses the area of potential disturbance from the proposed activities (500 m is the approximate disturbance distance from motorized activities or roads). This will be explained in detail in the affects analysis. The length of time for effects analysis is approximately 5 years for timber units and 5-10 years for precommercial thinning, prescribed burning, and other post-treatment activities. This is based on the probable contract length for the commercial harvest units and the timeframes for other activities.

The cumulative effects area (CEA) is expanded to include all lands of other ownership within the grizzly bear analysis area as well as within the Flint Foothills Project area. The CEA encompasses a total of 83,935 acres (340 km^2) and includes all NFS lands and lands of other ownership within the BDNF administrative boundary and corresponding 6th-level HUCs (figure 28.

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

For alternative 1, there would be no direct, indirect or cumulative effects to grizzly bear because no project activities are proposed. There would be no change in wildlife secure areas. This would maintain existing connectivity for transitory bears that might move across the project area or mountain range.

Alternatives 2 and 3

Direct, Indirect and Cumulative Effects

This proposal would result in changes to stand structure and species composition through salvage, thinning, seed tree harvest, prescribed burning and precommercial thinning. This also includes disturbance effects due to increased traffic, human activity, and equipment use during project activities.

Vegetation Treatments

Alternatives 2 and 3 propose commercial thinning, salvage harvest, seed-tree harvest, and precommercial thinning. All vegetation treatments are expected to reduce stem densities. In salvage units, dead trees lacking green overstory would be removed, thereby increasing sight distance and reducing horizontal cover. Potential value for salvaged stands for foraging and bedding use by grizzlies would decrease, but salvage units may still be utilized for travel. The effects of reduced foraging and bedding effectiveness would last 5-15 years, which is the period where existing snags would have fallen if the stand were left untreated.

Seed tree harvest in Douglas-fir and ponderosa pine types as well as commercial thinning in Douglas-fir stands would have similar effects in that residual stand structures would be more open, thereby decreasing cover for bedding, but facilitating travel. In addition, more open canopies would stimulate understory growth of grasses and forbs. In combination with subsequent underburning, forage value of the grass-forb component would be enhanced in lower elevation stands characteristically used by grizzly bears in the spring.

Precommercial thinning units currently contain high densities of small tree boles that present an obstacle to travel and little forage value. While precommercial thinning would reduce stem densities, residual slash retained within treatment units may deter bear movement until the slash deteriorates in subsequent years.

Changes in vegetation structure may influence stand use by bears for foraging, movement, or bedding. Therefore, both commercial and precommercial treatments may affect grizzly bear habitat.

Prescribed Burning

Habitat effects resulting from prescribed burning treatments outside timber harvest varies by elevation and unit. Burning in lower elevation stands (Units 1B, 2B, 6B, 7B, and 8B) would consume the grass, herb and shrub understory communities, along with the killing of seedling and sapling sized conifers in the understory. A few overstory trees (less than 5 percent) may also be killed from the understory burning. Prescribed fire would stimulate regrowth of senesced grass, herb and shrub understory communities, and increase vigor for the remaining conifers. Treatments would reduce cover somewhat, but increase grass/forb forage value in lower elevations.

Mid-elevation stands (units 3B, 4B, and 5B) consist of lodgepole pine-dominated forest with inclusions of Douglas-fir. Prior to burning, up to 10 percent of each unit would have small-diameter (4 to 12 inches d.b.h.) conifers slashed (cut down). Burning mid elevation mixed conifer (lodgepole dominated) stands would result in mortality of overstory and understory conifers in a patch mosaic across the proposed unit. The fire would directly consume a portion of the existing vertical and horizontal fuel, some of which has been created by mountain pine beetles. Prescribed burning in mid-elevation units is expected to stimulate regrowth of senesced grass, herb and shrub understory communities and natural regeneration of lodgepole pine as well as create opportunities for whitebark pine regeneration where suitable sites are created.

Implementation of burning may include either hand ignition, helicopter ignition, or a combination of both.

Activities such as slashing and helicopter use would temporarily increase disturbance in treatment units if grizzly bears are present.

Increased human presence in addition to project activities such as helicopter use during implementation of prescribed burns may cause temporary displacement of or avoidance by, grizzly bears if they are present in proximity to project activities. Therefore, prescribed burning activities proposed under both action alternatives may affect grizzly bears.

Access Management

Existing NFS Road Maintenance and Reconstruction

Roadside and road surface maintenance proposed under both action alternatives involves maintenance and improvements within the road prism. Activities primarily include blading, brushing, culvert and drainage maintenance, and spot gravel that would occur on about 68 miles (alternative 2) and 66 miles (alternative 3) of roads currently open to public access. These activities are not expected to increase public use, nor would they occur during existing restricted travel periods.

Existing Open and Closed Unauthorized Routes

Alternative 2 would utilize 1.7 miles of existing unauthorized routes (UR) for access and timber haul. Alternative 3 would utilize less (1.0 mile) for the same purpose. Both alternatives propose to include 0.7 mile of URs in the NFS subsequent to project use. Because these routes are currently open and were included in overall road density calculations, no increased access would result from inclusion in the project.

Under alternative 2, approximately 3.8 miles of closed URs would be opened for haul of timber products; whereas alternative 3 would open 2.3 miles of the same road type for haul. Both action alternatives would subsequently manage 0.4 mile of closed UR routes as NFS roads. Closed URs would temporarily add 3.8 and 2.3 miles to overall road miles open during implementation under alternatives 2 and 3, respectively. In addition, both action alternatives would add 0.43 mile to current road mile totals in the grizzly bear analysis area if managed as open to public use after project implementation.

New NFS Road Construction
Under alternative 2, a total of 1.3 miles of new road would be constructed for timber haul and subsequently included in the NFS road inventory. After project implementation, the road would be closed to public access and managed as Level 1 for potential future use. Therefore, this would add 1.3 miles to the total miles open temporarily during project implementation under alternative 2, but would not add to the net OMRTD post-project.

No new NFS road construction would occur under alternative 3.

New Temporary Roads
A total of 7.2 miles of new temporary roads would be constructed under alternative 2. These would be managed as closed to public use during project implementation, and subsequently decommissioned upon project completion. While no public access would be allowed, management activities such as equipment use and timber haul on these routes would contribute to an increase in OMRTDs during the period of operation. Duration of increased OMRTDs would be short-term, estimated to last one season for any given route. No new temporary road construction would occur under alternative 3.

Project Effects on OMRTDs

Table 47 summarizes road treatments and resulting OMRTDs by alternative for the summer and fall periods, at the landscape level and hunting unit level, respectively. During project activities, vehicle and equipment use of new and temporary roads for management activities would occur, thereby increasing disturbance temporarily. Roads would be closed to public motorized use during implementation. Use of all new and temporary roads for project implementation is not expected to occur simultaneously. Management activities would be distributed in space and time throughout the project area and roads would be obliterated or closed upon completion of activities associated with that road. In addition, most of the project area is in an October 15 – December 2 area restriction, where motorized use occurs only on designated routes during the hunting season. Although alternative 2 would reduce open roads by 0.6 mile, OMRTDs under both alternatives at the landscape and hunting unit scales would remain essentially unchanged after project completion.

Current OMRTD for summer is 2.1 mi/mi^2 (table 47). Use of closed and new temporary roads would temporarily increase summer OMRTD to 2.19 mi/mi^2 under alternative 2 whereas summer OMRTD under alternative 3 would increase slightly to 2.11 mi/mi^2. Post-project, alternative 2 would reduce open roads by 0.6 mile, thereby decreasing net OMRTD slightly to 2.08 mi/mi^2. Summer net OMRTD under alternative 3 would be identical to the existing density.

Table 47. Alternative 2 Summer OMRTD pre- and post- project activities, Flint Foothills Grizzly Bear Analysis Area (Alternative 3 in parentheses)

Analysis Area	Existing OMRTD	Miles new temp road	Miles of opened road, currently closed	Miles of new construction system road	Miles of Existing Road Decommissioned During the Project	OMRTD Post-project
Flint Foothills grizzly bear analysis area	2.1	7.2 (0)	3.8 (2.3)	1.3 (0)	4.4 (2.3)	2.1 (2.1)

OMRTD in mi/mi^2

Fall OMRTD within the grizzly bear analysis area is currently 1.3 mi/mi^2, which is identical to OMRTD at the hunting unit scale. Project design features state that current travel restrictions would be adhered to, with the exception of several roads that are closed year-round (which would be accessed during the summer season). Therefore, no increase in fall road densities would occur under either action alternative. Increased road densities during implementation may cause temporary displacement of or avoidance by, grizzly bears if they are present in proximity to project activities.

Project Effects on Security Areas

Grizzly bear secure habitat is defined in the GYA as areas more than 0.31 mile from an open or gated motorized access route or recurring helicopter flight line, greater than or equal to 10 acres in size (USDA Forest Service 2006). As mentioned previously, secure habitat for this project was calculated using the GYA definition and was also calculated using the definition from the Forest Plan which is habitat over 0.33 mile from an open motorized road or trail and over 10 acres in size. The measurement 0.33 mile is approximately 145 feet wider than the 0.31-mile grizzly bear buffer and was adopted to accommodate mapping for quiet recreation and depicts less secure habitat than would be available under the GYA calculation (USDA Forest Service FEIS 2009). Available secure habitat is calculated for both summer and fall seasons (see below) for both 0.31-and 0.33-mile buffer distances. Summer secure habitats are generated from the maximum open road densities at any given time during the year (summer season) whereas fall secure areas are more extensive as a result of road travel restrictions during the fall season (Oct. 15 – Dec. 2).

Summer Security (0.31-mile buffer)

There are approximately 27,303 acres of secure habitat in the project area following a 0.31-mile buffer distance from open motorized roads and trails (table 48). This is approximately 37 percent of the project area and mostly occurs in the south end (figure 28).

Summer Security (0.33-mile buffer)

Proposed road treatments in relation to existing summer security areas are shown in figure 29. Approximately 26,009 acres of secure habitat is mapped in the analysis area according to the Forest Plan definition for wildlife secure habitat. As mentioned previously, the BDNF definition for secure habitat was developed as a more conservative approach to wildlife security, with recreation managers. Secure habitat consists of 21 distinct blocks, with the largest block of secure habitat (18,988 acres in size) in the south end of the analysis area. Under alternative 2, new temporary roads that would access units 48C, 55C, 56C, 57C, 68C, and 71C are located inside or within 0.33 mile of existing summer security habitat.

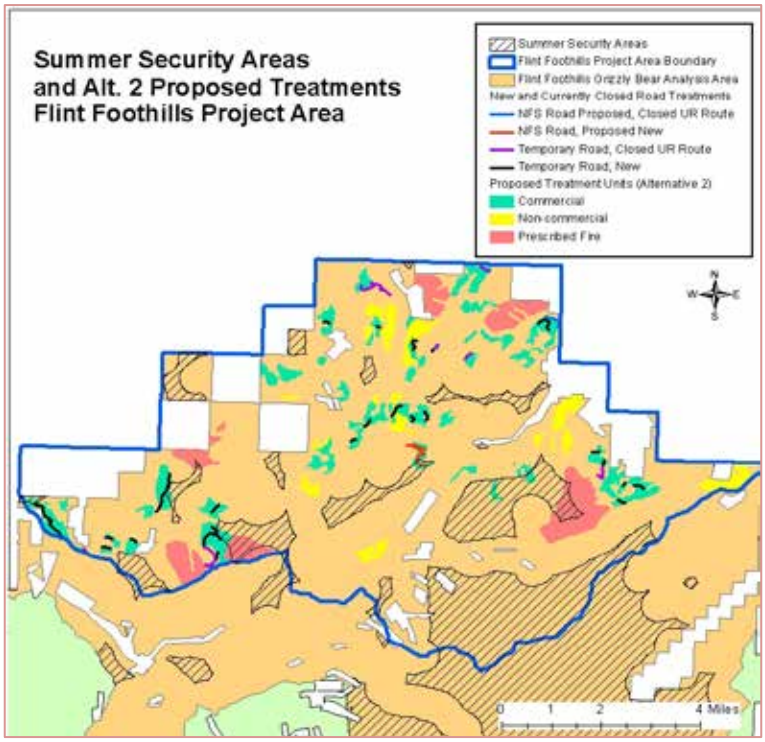


Figure 29. Grizzly bear summer security areas and proposed treatments for alternative 2

Use of these roads in the summer season during implementation would produce short-term disturbance on approximately 354 acres of summer security habitat. New NFS road construction designed to access units 36S and 47S (1.3 mi) would produce short-term disturbance on an additional 72 acres of summer secure habitat during implementation. Total area of summer security habitat affected by short-term disturbance, including 462 acres generated by use of existing closed roads, is about 816 acres for alternative 2. Summer security habitat would be reduced during project implementation from 35.2 percent to 34.1 percent (table 48).

For alternative 3, no short-term disturbance would occur in summer security habitat as a result of new temporary roads or new NFS road construction. Total area of summer security habitat affected by short-term disturbance is about 462 acres for alternative 3 due to use of existing closed roads for timber haul.

Table 48. Summer secure areas pre- and post-treatments by alternative

Buffer Distance from Open Motorized Road or Trail	Total Acres Secure Habitat		
	Existing	Unaffected by Project Disturbance	After Project Completion
Proposed Action			
0.33-mile buffer distance	26,009 (35.2%)	25,193 (34.1%)	26,011 (35.2%)
0.31-mile buffer distance	27,303 (36.9%)	26,894 (36.4%)	27,303 (36.4%)
Alternative 3			
0.33-mile buffer distance	26,009 (35.2%)	25,547 (34.6%)	26,009 (35.2%)
0.31-mile buffer distance	27,303 (36.9%)	27,291 (36.9%)	27,303 (36.9%)

Disturbance within security habitat during implementation may cause temporary displacement of or avoidance by, grizzly bears if they are present in proximity to project activities.

Post-project, summer security areas would be equal to existing amounts under both action alternatives. Therefore, the project would have no long-term effect to existing levels of summer security.

Fall Security (0.33 mile buffer)
Fall security area within the grizzly bear analysis area currently totals 37,222 acres (50.3 percent). Project design features for wildlife ensure that all units accessed or located in fall secure areas would be restricted during that period under both action alternatives. Therefore, no change in existing fall security habitat would occur during or after project implementation.

Wildlife Attractants

Human food items as well as some mechanical lubricants can attract wildlife; specifically bears. This project has incorporated a design feature that requires food storage as well as storage and cleanup of mechanical lubricants that could attract bears to work sites.

Livestock Grazing

Seasonal livestock (cattle) grazing occurs within the project area. This project does not propose changes to existing livestock numbers or distribution.

Cumulative Effects

The cumulative effects analysis area for grizzly bears is defined above and displayed in figure 28. The cumulative effects area encompasses a total of 83,935 acres (340 km2) and includes Forest Service lands (88 percent) and private lands (12 percent) within the BDNF administrative boundary. Review of the ongoing and foreseeable actions for actions that might affect prey or secure areas (areas with minimal human disturbance) on BDNF lands found that only travel analysis would have the potential to affect wildlife secure areas, but the decisions and associated effects are unknown at this time. Any update to travel management would consider wildlife secure areas and effects during that process.

On lands of other ownership within the cumulative effects analysis area, past, present, and reasonably foreseeable activities on these lands include livestock grazing and/or timber harvest. Small mining operations have occurred in the past on private lands. On lands of other

ownership, timber harvest could reduce secure areas on adjacent NFS land if additional roads are developed and accessible within 0.33 mile of BDNF lands; however, the potential for, and location of, future road developments on lands of other ownership is not identified. Because the distance of effect is only 0.33 mile, the potential impacts to grizzly bears and secure habitats at the analysis area-level would be minor.

Therefore, cumulative effects generated by vegetation modifications, temporary increases in disturbance, and temporary decreases in security areas as a result of the action alternatives, combined with other activities on National Forest System land and lands of other ownerships would not be significant.

Summary of Analysis

No observations of grizzly bears have been reported within the project area. However, recent increases in sightings on and near the northern portion of the BDNF may indicate a higher potential for grizzly bear occurrence in the future. Effects to grizzly bears and their habitats may occur as a result of temporary increase in road densities, temporary reduction in security summer security area, project-related disturbance, and vegetation modification. Consultation with USFWS concerning the effects of Flint Foothills project activities on grizzly bears will occur.

Sensitive Species

Regulatory Framework

The sensitive species analysis in this document meets the requirements for a biological evaluation as outlined in FSM 2672.42. Sensitive species are administratively designated by the Regional Forester and managed under the authority of the National Forest Management Act.

Species List

Information on sensitive species status and distribution, biological requirements, habitat and use on the BDNF was compiled in the Revised Biological Evaluation for the Forest Plan FEIS (USDA Forest Service 2009b). This document is the best available information for the species that were considered in this analysis. The Montana Natural Heritage's "Tracker" database was also consulted for species occurrence since the Forest Plan was formulated. Information for the new species was gathered from several references, as shown in the analysis. Table 49 lists the sensitive species considered in this analysis and summarizes existing habitats and species presence within the project area.

Table 49. Sensitive wildlife species list for the BDNF

Species	Habitat Preference	Habitat or Species Present in the Project Area?
Birds		
American peregrine falcon (*Falco peregrinus anatum*)	Prominent cliffs with ledges for nesting within 1 mile of water and 10 miles of hunting habitat including riparian areas, parklands and mountain valleys	No. The nearest known territory is located approximately 12 miles to the north (Rogers et al 2009).Migratory birds may pass through but no suitable cliff nesting sites.
Black-backed woodpecker (*Picoides arcticus*)	Burned or insect-killed forest	Yes. Potential habitat is increasing due to insect-caused mortality of lodgepole pine.

Species	Habitat Preference	Habitat or Species Present in the Project Area?
Bald eagle (*Haliaeetus leucocephalus*)	Nesting trees/platforms near an open water body (>80 ac) or major river system; available fish and water bird species prey near nesting habitat; forages on carrion in winter or during spring/fall migration.	Yes. No known nesting on FS lands. One breeding site is identified northwest of the project area, along Flint Creek (MFWP 2010). Suitable foraging habitat is located within one mile of the project area.
Greater sage grouse (*Centrocercus urophasianus*)	Sagebrush obligate	No. There are no sage grouse leks or State core areas anywhere on the Deerlodge NF. The entire Pintler RD and the Deerlodge Valley are outside the current and historical species' distribution range. Project area also lacks suitable sagebrush habitats
Flammulated owl (*Otus flammeolus*)	Mature (>9" d.b.h.) and old growth ponderosa pine/Douglas-fir with abundant moth prey	Yes. Dry Douglas-fir and ponderosa pine. Sightings within the project area have been recorded.
Harlequin duck (*Histrionicus histrionicus*)	Fast moving, low gradient clear mountain streams	No. Only known location on BDNF is on Middle Fork of Rock Creek on Pintler RD, more than 35 miles southwest.
Trumpeter swan (*Cygnus buccinator*)	Large water bodies with sufficient emergent vegetation and invertebrates, and appropriate nest sites	No, the project area lacks known occurrences and suitable habitat.
Mammals		
Bighorn sheep (*Ovis canadensis*)	Bighorn sheep are adapted to a wide variety of habitats but three elements are essential to quality habitat: 1) escape terrain; 2) high visibility; and 3) winter ranges are low-elevation, south-facing slopes, with escape cover in close proximity to foraging areas (MFWP 2010). WAFWA guidelines (2007, 2010), however, emphasize separation from domestic sheep as crucial to maintaining wild sheep	Yes. The Garrison herd occupies areas primarily on private lands approximately 3 miles east-northeast of the project area. Some use of higher elevation areas on BDNF lands by bighorns has been reported, and individual rams have been located to the west near Boulder Creek, and south near Powell Mine (MFWP 2010). There are no domestic sheep allotments anywhere on Deerlodge NF lands.
Fisher (*Martes pennanti*)	Moist coniferous forested types (including mature and old growth spruce/fir), riparian/forest ecotones	Yes, potential habitat is present, but no known records.
Gray wolf (*Canis lupus*)	Areas free from human disturbance, abundant prey populations	Yes. Flint Creek pack on north end of the Clark Fork-Flints landscape.
Great Basin pocket mouse (*Perognathus parvus*)	Dry grasslands with less than 40% cover	No. Known to occur in Beaverhead County and suspected in Madison County. Project area is outside species' range.
North American wolverine (*Gulo gulo luscus*)	Large areas of unroaded secure habitat; alpine/subalpine talus slopes for secure denning habitat, ungulate carrion in winter	Yes. Potential habitat is located in the southern portion of the project area. Known records generated south of the project area.
Northern bog lemming (*Synaptomys borealis*)	Wet riparian sedge meadows, bog fens	No, nearest known location at Maybee Meadows on Wisdom RD.

Species	Habitat Preference	Habitat or Species Present in the Project Area?
Pygmy rabbit (*Brachylagus idahoensis*)	Dense clumps of big sagebrush or greasewood. Forage on grasses (wheatgrass, bluegrass) in summer and sage in winter	No. The project area is located north of the known pygmy rabbit distribution, and lacks suitable sagebrush habitats.
Spotted bat (*Euderma maculatum*)	Cliffs, rock faces for roosting. Forest openings, riparian areas, wet meadows for foraging.	Foraging and roosting habitat present. Proposed treatments will have no impact on suitable habitats.
Townsend's big-eared bat (*Corinorhinys townsendii*)	Roosts in caves, mines, rocks and buildings. Forages over tree canopy, riparian areas or water.	Foraging and roosting habitat present but no known maternity colony or hibernacula.
Special Interest		
Northern goshawk (*Accipiter gentilis*)	Nests in mature conifer forest with high canopy closure (50-90%) and open understories.	Yes. Suitable habitat is present and nesting is reported for the project area.
Great grey owl (*Strix nebulosa)*	Mid- or late-successional conifer forest within 300 yards of montane meadows from 2,000 to 8,000 feet elevation.	Yes. Suitable habitat is present and observations are reported for the project area.

Species Not Carried Forward For Detailed Analysis

Based on table 49 the American peregrine falcon, greater sage grouse, harlequin duck, Great Basin pocket mouse, northern bog lemming, pygmy rabbit, trumpeter swan and spotted bat are not carried forward for further analysis because of lack of suitable habitat within the analysis area, distance from known locations, or lack of potential impact to the species or its habitats. This proposal would have "no impact" on these species. Additional information on these species is provided in the wildlife report in the project file.

Sensitive Species Carried Forward for Further Analysis

Bald Eagle

Overall Population and Habitat Status and Distribution

Bald eagles are now widely distributed across the United States. Montana has the third highest population in the lower 48 states west of the 100th meridian. In 2007 there were 325 pairs in Montana.

Biological Information for Bald Eagles

Bald eagles are associated with aquatic environments, occupying riparian or lakeside habitats almost exclusively during the breeding season. Food habits are wide-ranging including fish, waterfowl, and carrion (both wild ungulates and livestock). In Montana, nest sites are usually found within 1 mile of water, and located in larger, dominant trees, most often the tallest trees in the nest stand.

Bald eagles are a resident species in the forested, mountainous areas of Montana. Other individuals from more northerly altitudes either winter in Montana or migrate through the state to more southerly locations. Residents generally remain in the vicinity of their breeding areas

throughout the year, while some may move to areas with more temperate weather or to areas with higher concentrations of food.

Bald Eagle Habitat and Use of the Analysis Area

Flint Creek lies to the west of the project area. There is one known nest site along Flint Creek located northwest of the project area (MNHP 2011). Although no sightings have been reported, foraging may occur at Flint Creek which is located approximately 0.9 mile from proposed treatments. No winter bald eagle observations are reported in proximity to the project area (MNHP 2011). The nearest reported nonbreeding or winter occurrence is located along the Clark Fork River, approximately 5 miles from the project area boundary.

Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

For alternative 1, there would be no direct, indirect, or cumulative effects to bald eagles or bald eagle habitat from the Flint Foothills Vegetation Management Project because no project activities are proposed.

Alternatives 2 and 3

Direct, Indirect and Cumulative Effects

There would be no direct or indirect effects because no harvest activities would occur within 1 mile of known nesting or winter roosting areas. Project activities are proposed within 1 mile (0.9 mile) of Flint Creek where bald eagle foraging may occur. However, because proposed treatments are located east of this creek on an east-facing ridge, topographic features would prevent disturbance to eagles foraging along Flint Creek. All timber haul routes are greater than 0.50 mile from known bald eagle nesting. Haul routes within 1 mile of bald eagle nesting consist of well-traveled county roads and state highway where existing levels of vehicle use preclude additional disturbance effects due to timber haul. Bald eagle foraging within the project area may occur in late fall, winter, or early spring when carcasses from dead big game would be available. The proposed activities would not affect availability of carcasses for bald eagle foraging. In addition, no impacts to bald eagle nesting or winter activity are expected under any alternative.

There would be no direct or indirect effects, so there would be no cumulative effects. Therefore, this proposal would have no impact on this species or habitat.

Black-backed Woodpecker

Overall Population and Habitat Status and Distribution

The black-backed woodpecker breeds from central Alaska and northern Canada south to the mountainous regions of California, Wyoming, Black Hills, upper Great Lakes and New England states and into Newfoundland. The Montana Natural Heritage program has 16 confirmed breeding records in Montana as of 2008. Fifteen of the records are located in northwestern Montana counties. Unconfirmed breeding records exist that would expand their range to most counties in the western part of the State, including areas in southwestern

Montana, the Big and Little Belt Mountains and the Bridger Range (USDA Forest Service 2009b).

In 2006, the Avian Science Center, University of Montana, conducted a stratified random, grid-based survey of mountain pine beetle-killed lodgepole in northern Idaho and parts of western Montana. They detected black-backed woodpeckers in less than1 percent of the sites surveyed. The Northern Region Landbird Program has documented three detections from the Forest from 1994-2004 (USDA Forest Service 2009b). Samson (2006) lists the species as uncommon on the BDNF. The Montana Natural Heritage database has no detections anywhere in the Flint Range from 2007 to date (Database accessed 8/06/2012).

Tree mortality caused by insects, disease, and fire are ecological processes that are important for black-backed woodpeckers. These processes operate at relatively large scales both in time and space due to factors such as climate. The species itself is adapted to irruptive movements over large distances to new sources of habitat. This suggests that a viability strategy for the black-backed woodpecker should be regional in scale; that distribution of habitat is not a limiting factor; and that lack of habitat in the BDNF at some points in time would not impair the viability of the species as a whole if such habitat existed elsewhere (USDA Forest Service 2009b).

Samson (2006) reported that black-backed habitat (post-fire and insect outbreaks) has increased across the Region in the last decade. On the BDNF, he reported 48,520 acres of habitat in 1990-1993; by 2000-2003 suitable habitat had increased to 174,084 acres. Samson also found that habitat was well-distributed and would not limit black-backed woodpeckers from interacting Region wide. Updated habitat estimates in 2008 (Bush and Lundberg 2008) reported an increase to 395,155 acres of habitat on the BDNF. The Forest Plan FEIS -appendix B states "…habitat on the BDNF is approximately 13.4 times the amount needed to meet the threshold for viability across the entire Northern Region." Bush and Lundberg (2008) also show that neighboring forests have sufficient habitat above Samson's (2006) habitat threshold.

Since the time of these analyses, mountain pine beetle numbers have continued to increase across the Forest. In 2005 and 2006 the Region received normal amounts of precipitation and resulted in reductions in population levels of mountain pine beetle. However, in 2007 there was a return to drier-than-normal conditions and infested areas have been increasing since then.

Bonn et al. (2007) summarized Key Findings; (1) populations appear to be increasing in the United States; (2) habitat is abundant and well-distributed across the Region and by Forest; (3) habitat has recently increased and is expected to continue to increase as fires and outbreaks continue; (4) the level of salvage timber harvest is insignificant across the Region; and (5) the amount of habitat required for a minimum viable population compared to that available indicates that it far exceeds that needed, given the natural distribution of the species and their habitat.

Biological Information for Black-backed Woodpeckers

In Montana, preferred habitat consists of coniferous forests (spruce-fir types) especially sites that were previously burned or experienced windfall. The species nests and forages in sites that were recently disturbed (i.e., typically 5 years) and also nests in dense forest stands. They are primary cavity nesters, excavating their own cavities in April and May, often in dead or dying conifers. The young depart from the nest from early June through early July.

They are highly responsive to forest fire and other processes, such as spruce budworm or mountain pine beetle outbreaks, resulting in high concentrations of wood-boring beetles invading dead trees. Local and regional irruptions and range extensions have been observed in response to burns and wood-borer outbreaks (USDA Forest Service 2009b). One study of black-backed woodpeckers in ponderosa pine in the Black Hills found that they were strongly associated with the presence of wood-borers; mountain pine beetles create habitat for wood-borers (Bonnot 2006). However, lodgepole pine (which is present in the project area) has thinner phloem with less area for wood-borer beetles.

While Hutto (1995) described post-fire habitat as definitely preferred, he also noted the value of having large-diameter green trees available as foraging substrate after fire. Mature and old-growth coniferous forests with decadent trees, snags and fallen logs are important to provide heart-rot in trees and snags for nests, diseased trees for roosts, and beetle infested trees for foraging (USDA Forest Service 2009b). Recent infestations of mountain pine beetle would be expected to benefit black-backed woodpeckers by increases in foraging habitat.

Black-backed Woodpecker Habitat and Use of the Analysis Area

There have been no wildfires in the project area in suitable habitats within the last 10 years, and there are no preferred post-fire foraging habitats in the project area. There have been no confirmed observations of black-backed woodpeckers in the project area during field reviews. Woodpecker surveys conducted in units 10, 11, 15, 16, 27, 43, and 45 during the summer of 2010 found three-toed woodpeckers, but no black-backed woodpeckers.

Table 40 shows that there are 17,144 acres of lodgepole pine and subalpine fir stands that average greater than 5 inches d.b.h. Within the project area, it is estimated that virtually all (over 16,500 acres) of the lodgepole pine stands 5 inches or greater d.b.h. have been affected by mountain pine beetle (Vegetation section).

Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

For alternative 1, there would be no direct, indirect or cumulative effects to black-backed woodpeckers or habitat because no project activities are proposed. Continued infestations of mountain pine beetle (and other insects) would provide foraging and nesting habitat across the analysis area. However, after a few years, the dead trees no longer provide habitat for beetles (once the wood is dried out) and foraging habitat would decline. Dead lodgepole pine trees would eventually fall (5-15 years). While local reductions in foraging habitat may occur over time, adequate amounts of potential habitat are expected to remain available at the landscape scale in the long term (table 50).

Based on projected habitat availability, this alternative would have no impact on this species or habitat.

Alternatives 2 and 3

Direct and Indirect Effects

This proposal would result in changes to stand structure and species composition through salvage, thinning, seed tree harvest, prescribed burning and precommercial thinning. Those

project activities would include disturbance effects due to increased traffic, human activity, and equipment use during project activities.

However, disturbance has not been found to be of concern for this species (Bonn et al. 2007), and this analysis will focus on changes to habitat through commercial salvage in lodgepole pine as this vegetation type provides the most suitable foraging and nesting habitat.

The effects analysis is based on acres of potential habitat affected, and timing of activities. Direct effects to woodpeckers are unlikely but there could be effects to eggs or nestlings in those units that would be salvaged during the breeding season. Given that black-backed woodpeckers appear in low densities in unburned habitats, and none were documented during analysis area surveys or in adjacent areas, the chance of direct effects is low. If a nest is found, a timing restriction during the breeding season would be implemented; June 1 – August 31 to prevent nests, eggs, or nestlings from being destroyed (Bonnot 2006).

Salvage of lodgepole pine would occur on approximately 1,163 acres, or 6.6 percent of potential habitat (including spruce-fir) on National Forest System lands under alternative 2. Lodgepole pine salvage under alternative 3 would occur on 1,022 acres, or 6.2 percent of potential habitat. Salvage of these dead and dying trees would reduce foraging or nesting habitat within the units, as the only lodgepole pine trees to be retained would be those larger than 15 inches d.b.h. (and other species). In a study of black-backed woodpeckers in the Black Hills, Bonnot (2006) found that recent occurrence of salvage logging near a nest site did not appear to affect nest survival. Greater than 50 percent of the nests observed were in areas where logging had occurred within the last 5 years.

Under the proposed action, 12 salvage units are larger than 40 acres. This would not affect suitability for use for the black-backed woodpecker, because they are a highly mobile species and easily pass through large openings. Black-backed woodpecker habitat would be maintained across the project area because only 6.6 percent (6.2 percent for alternative 3) of suitable habitat greater than 5 inches d.b.h. would be salvaged, and the remaining 93-94 percent has been affected by mountain pine beetle.

Within the proportion that is salvaged, snags would be retained to meet Forest Plan standards (project design features and mitigation measures, chapter 2).

Prescribed burning treatments on 1,259 acres of mid-elevation conifers have the potential to increase snag presence. Crown mortality in patches up to 20 acres in size would be the objective on about 40 percent of treatment units. This equates to approximately 504 acres where suitable habitat for black-backed woodpecker could be created or already exists due to advanced levels of tree mortality.

At the landscape scale, adequate amounts of potential habitat are also expected to remain available in the long-term. ERG (2010) modeled potential habitat in the Clark Fork-Flints landscape under treatment and no-treatment scenarios. The treatment scenario was projected to maintain more acres of potential habitat than the no-treatment scenario (table 50). In the treatment scenario, projected increases in available habitat in future decades appears counterintuitive and is likely attributed to reduced fire severity in the short term that defers that mortality to future decades. Changes are more likely due to the inherent stochastic nature of the model than any substantial treatment effects. Modeling results indicate that habitat for black-backed woodpeckers will exceed historic range variables by several-fold, regardless of treatment (ERG 2010).

Table 50. Modeled acres of potential black-backed woodpecker habitat for alternatives 2 and 3 from 2010 to 2060

Clark Fork-Flints Landscape	2010	2020	2030	2060
No Treatment	225,652	320,428	275,820	348,744
Treatment	225,652	331,178	292,850	359,531

(source: ERG 2010)

Cumulative Effects

This species has a relatively small home range (average 300 acres, Dixon and Saab 2000); therefore, the cumulative effects area consists of the Flint Foothills project area.

Firewood cutting and hazard tree removal are the actions that could affect habitat within the project area. Those not having effects (availability of nesting or foraging habitat) that were not addressed include livestock grazing, weed management, road and trail maintenance, mine reclamation, and travel analysis.

Effects of past timber management actions on NFS lands have been incorporated into the existing conditions for levels of mature forest in the analysis area. Private inholdings total 7,512 acres within the project area. So far, harvest on private inholdings has occurred on approximately 80 percent (about 5,500 acres) of the forested portions. Most of the harvest on private land took place in the 1980s. Not all of the inholdings are forested; about 10 percent are nonforested (dry grassland areas). It is not known whether additional acres of private harvest would occur.

There have been no wildfires in suitable habitat in the project area within the last 10 years and there are no preferred post-fire habitats within the project area.

Hazard tree removal along roadsides would continue until the contract is completed. To date, 117 acres of roadside salvage have occurred within the project area with 29 acres remaining.

Personal use firewood gathering by the public would continue based on the forest firewood permit system. With the recent mountain pine beetle mortality, firewood cutting has increased resulting in loss of snags for wildlife habitat. As the beetle mortality spreads, more trees will be killed and available for firewood, where accessible. There are approximately 162 miles of open road. Off-road limitations to the public for firewood gathering constrain the affects to roadway corridors. Considering the amount of dead trees available near roads, it is reasonable to assume a 70-foot firewood gathering corridor, which equates to 1,375 acres[30]. However, portions of the road system cross through areas that are not habitat (grasslands/shrublands, Douglas-fir and high-elevation sites). Roads within lodgepole pine stands averaging greater than 5 inches d.b.h. total about 41 miles, thereby potentially affecting 348 acres.

Cumulatively, treatments proposed in lodgepole pine under this project (proposed action - 1,163 acres) in addition to ongoing and foreseeable hazard tree removal and firewood cutting total an estimated 1,657 acres on the BDNF. This equates to approximately 10 percent of mid- to late-

[30] The BDNF website states that,with a firewood permit, dead trees can be cut anywhere except in timber sales (marked with signs or painted trees), on private
The BDNF website states that, with a firewood permit, dead trees can be cut anywhere except in timber sales marked with signs or painted trees, on private property, in campgrounds or recreation areas, or within 150 feet of water. Exceptions include wilderness, wilderness study area, recommended wilderness, research natural area, or other areas closed to firewood cutting.

seral lodgepole pine that currently exists within the project area, leaving approximately 90 percent of the host stands for mountain pine beetle untreated under the action alternatives. Ninety percent of potential black-backed woodpecker habitat would remain in the project area, so there is adequate habitat remaining in the analysis area to support black-backed woodpeckers considering cumulative effects. Habitat for black-backed woodpeckers would remain widespread and abundant as long as mountain pine beetles (and secondary beetles such as wood borers) are present.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

There are no specific Forest Plan standards for black-backed woodpeckers. However, this project incorporates Plan standards for snags, live tree and down wood retention, all habitat components that are used by many species of woodpeckers (PDFs Chapter2).

Summary of Effects

Proposed treatments would remove up to approximately 7 percent of existing foraging habitat. Plan direction for snag, live tree and downed wood would be retained in treated areas. Unsalvaged potential habitat would continue to be widespread and abundant in the project area, as well as forestwide and regionwide; habitat for the woodpecker has increased dramatically in the last decade; and habitat would remain well-distributed. When considering all of the actions affecting potential habitat, at least 90 percent of the stands would continue to provide potential foraging and nesting habitat as long as mountain pine beetles and secondary beetles are present. Based on the above, implementation of the action alternatives may impact individuals or habitat but will not likely result in a trend toward federal listing or reduced viability of the population or species.

Flammulated owl

Overall Population and Habitat Status and Distribution

Flammulated owls are migrants that winter in Central America and breed throughout montane coniferous forests of western United States and Mexico.

Population viability modeling (Samson 2006) indicates that existing flammulated owl habitat is not limiting viability at the scale of the Forest or Region.

Biological Information for Flammulated Owls

The flammulated owl forages almost exclusively on insects, especially moths and beetles and forages in the tree canopy, between trees, and on the ground (Powers et al. 1996). They are secondary cavity nesters that often use old pileated woodpecker or northern flicker cavities as nest sites, and nest cavities may be used for several years.

In the northern Rockies, flammulated owl breeding habitat consists primarily of low- to mid-elevation montane forests with low to moderate canopy closure, a large tree component, snags and a brushy understory. “They appear to require relatively open areas, or patches of openings for foraging, in combination with dense patches of usually younger trees or dense foliage (e.g., mistletoe) for roosting. Optimal areas may be the transition between mesic and xeric sites where large snags are found near stands of Douglas-fir regeneration and small grassy openings” (Smucker et al. 2008).

Although older ponderosa pine forests and ponderosa pine/Douglas-fir forests are commonly selected for nesting, breeding has also been reported in older Douglas-fir forest types and to a

lesser extent in grand fir, western larch, spruce/fir, lodgepole pine and aspen habitats (USDA Forest Service 2009b). In a study in the Bitterroot Mountains (Wright 1996), at the broadest scale, flammulated owls occupied landscapes with a higher proportion of low to moderate canopy closure (less than 70 percent) ponderosa pine/Douglas-fir that other cover types. At the home range scale they were positively associated with non-forest openings; and the presence of snags and large trees at the micro-habitat scale. Day roosting habitat consists of thickets or stands with multilayered canopies and canopy closure greater than 50 percent in proximity to nest sites (Goggans 1986).

Flammulated Owl Habitat and Use of the Analysis Area

On the BDNF, dry forest types preferred by the flammulated owl are largely confined to the Deerlodge portion west of the Continental Divide. The Montana Natural Heritage Program (MNHP 2011) shows evidence of breeding in the northern portion of the landscape. Based on existing vegetation information, areas with the largest areas of mature Douglas-fir and ponderosa pine forest occur at mid to lower elevations within the project area. As noted in table 40, there are 11,234 acres of Douglas-fir and ponderosa pine stands averaging 10 inches or greater d.b.h. in the project area. About 4,636 acres consist of stands with less than 40 percent canopy closure.

Flammulated owl surveys were conducted during the summers of 2010 and 2011 in the project area. Detections were recorded in or adjacent to units 1ST, 20C, 23C, 24C, and 25C.

Environmental Consequences

Alternative 1 – No Action

Direct and Indirect Effects

For alternative 1, there would be no direct, indirect or cumulative effects to flammulated owl or habitat from the Flint Foothills Vegetation Management Project because no project activities are proposed. Douglas-fir and ponderosa pine stands would continue to increase in density and canopy layering, thereby reducing available flammulated owl habitat. Where the stands are densest, individual trees may die from competition or insects. Over time, canopy gaps would fill in and result in a decline of other species (aspen, shrubs, herbaceous vegetation). Higher stand densities and development of ladder fuels would increase the risk of wildfire, bark beetle infestations, and in some areas, successional replacement by shade-tolerant competitors (Fiedler et al. 2010). It is expected that under the no-action alternative, mortality in Douglas-fir and ponderosa pine would continue at an increasing rate. The increase in mortality is expected in the analysis area given the current trend in local climatic conditions coupled with the current dense and multi-layered stand conditions common in the Flint Foothill area for the Douglas-fir and ponderosa pine vegetation community (Vegetation section).

Forest Vegetation Simulation (FVS) modeling indicates that current mature stands with 15-inch dominant trees) would not attain old growth characteristics in a 50-year period due to mortality from bark beetles. Existing old growth may be reduced due to mortality to large trees from bark beetles, with large ponderosa pine trees potentially becoming scarce. Modeling of the 50 year trend (with FVS) for one stand that is currently old growth estimated a reduction of ponderosa pine and the stand losing enough large trees to fall out of old growth status. The future trend due to beetle-caused large tree mortality is for fewer acres of low elevation old growth in the project area (Vegetation section).

ERG (2010) estimated that at the Forest-scale only 4 percent of forested acres meet the criteria as suitable for this species. Modeling of the no-action alternative through time at the landscape scale predicts that habitat would continue to decline in the Clark Fork-Flints landscape in both the short-term (10 years) and long-term (past 10 years) due mainly to loss of habitat to high severity wildfires (table 51).

Table 51. Modeled acres of potential flammulated owl habitat for alternative 1 from 2010 to 2060

Clark Fork-Flints	2010	2020	2030	2060
No Treatment	60,648	36,148	19,392	28,612

(source: ERG 2010)

Cumulative Effects

Flammulated owl home range size averages from 25 to 47 acres (appendix F). Therefore, the primary cumulative effects analysis area is the project area.

Past actions consisting primarily of fire suppression, and to a lesser extent logging of mature Douglas-fir, have led to reduced amounts of open and moderately dense Douglas-fir and ponderosa pine that constitutes suitable flammulated owl habitat. Continued wildfire suppression at lower elevations containing Douglas-fir and ponderosa pine would reduce the potential for low or moderate-intensity fires that may enhance structural suitability, but would also reduce the potential for high-intensity stand replacing wildfires that would remove existing suitable flammulated owl habitat in both treated and non-treated areas. Management of wildfire at higher elevations could enhance habitats where Douglas-fir occurs if fire intensities are low to moderate. There are no other ongoing or foreseeable projects or activities that would be expected to affect mature Douglas-fir and ponderosa pine stands. Most firewood cutting occurs in lodgepole pine (abundant and easier to cut and split). Therefore, cumulative effects to the flammulated owl or owl habitat may occur but are not quantifiable.

Summary of Effects

Based on predicted trend for habitat availability, the no-action alternative may impact individuals or habitat but will not likely result in a trend toward federal listing or reduced viability of the population or species.

Alternatives 2 and 3

Direct and Indirect Effects

Both action alternatives propose treatment in Douglas-fir and ponderosa pine stands. Alternative 2 would treat a total of 1,139 acres by commercial thinning and 353 acres by seed tree harvest. Alternative 3 would treat 666 acres by commercial thinning and 353 acres by seed tree harvest. In addition, 731 acres of low-intensity underburning at lower elevations is proposed under both action alternatives.

Direct effects to flammulated owls are possible because there could be effects to eggs or nestlings in those units that would be treated during the breeding season if owls are present. Surveys documented flammulated owl presence in and adjacent to several proposed treatment units. Project design features that require flammulated owl survey prior to treatment in units 20C, 23C, 24C, and 25C have been incorporated. If a nest was found, a timing restriction during the breeding season would be implemented; no activity May 15 – August 15. The limited operating period is based on Reynolds and Linkhart (1987); territories were occupied by

the third week of May, and the mid-August date accommodates the period post-fledging when owlets can still be found in the vicinity of the nest (McCallum 1994). A nest buffer of approximately 35 acres would be applied as this is the nesting home range and the area where fledglings are found immediately after fledging (appendix F).

Proposed treatments under both action alternatives that would have the potential to indirectly affect flammulated owls consist of commercial thinning, seed tree harvest, and prescribed burning within Douglas-fir and ponderosa pine stands. In the commercial thin Douglas-fir units, stand densities would be reduced from 90-220 square feet of basal area to a density that averages between 40 to 60 square feet of basal area. Old-growth stands proposed for treatment under alternative 2would have a higher basal area retained. Commercial activities under alternative 2 would treat about 401 acres of stands with less than 40 percent canopy closure and d.b.h. 10 inches or greater, or approximately 8.6 percent of suitable stands within the project area. Treatments in stands with canopy closure greater than 40 percent total about 897 acre (19 percent). Alternative 3 would treat a total of 334 acres of existing stands with less than 40 percent canopy closure, or about 7.2 percent of existing. Under alternative 3, treatments in stands with canopy closure greater than 40 percent total about 535 acres (11.5 percent). Prescribed burning would occur in an additional 431 acres under both action alternatives, equating to 9.2 percent of existing habitat.

The 50-year-trend for the commercial thin non-old growth stands would be large, open-grown ponderosa pine and Douglas-fir stands that are resilient to inherent disturbance regimes (insects and fire). FVS modeling of a commercial thin and prescribed burn treatment shows that in 50 years there would be widely spaced trees (up to 30+ inches in diameter with basal area ranging from 40 to 100 square feet per acre). An increase of ponderosa pine resulting from the proposed treatments is also predicted. Average diameters for these stands would more than double, which means that smaller trees are not common or if present, occur in openings within the tree canopy, and that there are larger diameter trees than without treatment. Shrubs and forbs are common, but are low growing. Species composition favors ponderosa pine, although Douglas-fir is common. However, without additional future disturbances that approximate the natural fire intervals of the past (i.e. low intensity fire every 20 years on average), stands would revert back to conditions reducing available flammulated owl habitat as described in the no-action alternative.

Commercial thinning in stands classified as old growth (121 acres) under alternative 2 would result in widely-spaced large diameter trees retained at 60 to 80 square feet of basal area with small trees primarily occurring in clumps while still meeting old growth condition defined by Green et al. (2007). Additional younger, mature large trees would be retained to perpetuate large trees on the site.

Commercial thinning treatments that retain canopy closures greater than 35 percent would be expected to maintain or improve habitat for flammulated owl foraging and nesting as structural densities are reduced and large diameter trees are maintained along with pockets of seedling to sapling trees. Thinning treatments in these stands are expected to retain old growth characteristics in both the short and long terms, thereby reversing the trend described for the no-action alternative where larger diameter trees succumb to bark beetles, and existing old growth stands may become non-old growth. Forest Vegetation Simulation (FVS) modeling of one old growth stand within Unit 23C indicates that without treatment and continued high mountain pine beetle activity, the stand would fall out of old growth status in 50 years with a reduction of ponderosa pine in the stand. The 50-year-trend (using FVS modeling) for

prescribing a thin with the same old growth stand and high mountain pine beetle activity indicates that the stand would still be old growth in 50 years, with an increase in the ponderosa pine component (Vegetation section).

Due to existing variability among stands as well as treatment prescription, post-treatment canopy closure within commercial thinning units under both action alternatives is expected to range from 20-50 percent. Wildlife habitat models developed for the Northern Region FIA database and based on current science use a canopy cover range of 35-85 percent for flammulated owl habitats including nesting, foraging, and roosting (Bush and Lundberg 2008). Therefore, treated stands with residual canopy closure below 35 percent would not be suitable for flammulated owls. Over time, canopy closure would increase to the point of suitability due to tree growth in response to reduced stand density. All commercial treatments would retain all green trees greater than 20 inches d.b.h. Proposed treatments would also maintain the snag component according to Forest Plan standards. While commercial thinning treatments are expected to improve nesting and foraging habitats in stands with canopy closures exceeding 35 percent roosting habitat in the form of dense multi-storied forest patches would be removed within treatment units. Roosting habitat is expected to remain available in untreated stands adjacent to treatment units.

Seed tree treatments would result in very open stands with canopy closures below levels identified as suitable (35 percent), thereby removing suitable habitat on 171 acres (3.7 percent) under both action alternatives. Treatments would retain ponderosa pine presence in the long term and provide for development of suitable nesting and foraging habitat through time.

Prescribed burning on 436 acres (the low elevation prescribed burn units), would reduce understory densities and may reduce overstory density by causing mortality in less than 5 percent of overstory trees, but is expected to maintain stand conditions suitable for flammulated owls.

ERG (2010) modeled no treatment and treatment scenarios through time at the landscape scale. Under both scenarios, the model predicts that habitat will continue to decline in the Clark Fork-Flints landscape for over 20 years until showing an increase by year 50 (table 52). Available habitat throughout the modeling period in the treatment scenario ranged from 2 percent-22 percent more than in the no treatment scenario depending on the year modeled. Results indicate that habitat at the landscape scale would decrease, but continue to be available in the long term under both scenarios.

Table 52. ERG (2010) modeled acres of potential flammulated owl habitat, treatment and no treatment scenarios

Clark Fork-Flints	2010	2020	2030	2060
No Treatment	60,648	36,148	19,392	28,612
Treatment	60,648	36,813	24,584	32,423

(source: ERG 2010)

Cumulative Effects

Flammulated owl home range averages from 25 to 47 acres (appendix F). Therefore, the cumulative effects analysis area is the project area.

There are no ongoing or reasonably foreseeable future projects which would measurably affect mature Douglas-fir and ponderosa pine stands within the project area. Roadside hazard tree

removal and most firewood cutting occur primarily in lodgepole pine. Both spruce budworm and Douglas-fir beetle would continue to cause mortality in the mature Douglas-fir stands. Some level of snags provides habitat within these stands, but at some point the loss of live canopy cover would decrease suitability of the stand (when live canopy cover is less than 35 percent)

Continued wildfire suppression at lower elevations containing Douglas-fir and ponderosa pine would reduce the potential for low or moderate-intensity fires that may enhance structural suitability, but would also reduce the potential for high-intensity stand replacing wildfires that would remove existing suitable flammulated owl habitat in both treated and non-treated areas. Management of wildfire at higher elevations could enhance habitats where Douglas-fir occurs if fire intensities are low to moderate. Proposed thinning treatments would open stands and increase suitability, thereby counteracting the negative impacts of wildfire suppression on a relatively small portion (20 percent) of Douglas-fir stands. The cumulative effects of the thinning treatments and continued wildfire suppression on suitable habitat are not quantifiable because suppression also reduces risk of stand-replacement fires with potential to remove habitat.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

This project includes a project design feature to address the Forest Plan standard for mitigation of effects on known active nests of TES raptors. This standard would be implemented if an active nest site is found before or during implementation (project design features and mitigation measures, chapter 2). In addition, meeting the large snag standards can also provide habitat for flammulated owls per habitat requirements noted in Wright (1996) and Smucker et al. (2008).

Summary of Effects for Alternatives 2 and 3

Based on the above analysis, implementation of either action alternative may impact individuals or habitat but will not likely result in a trend toward federal listing or reduced viability of the population or species.

Bighorn sheep

Overall Population and Habitat Status and Distribution

Montana had approximately 5,700 bighorn sheep prior to the die-offs that began in 2009. It is commonly accepted that the introduction of diseases from old world sheep and goats into North America, as well as hunting, have contributed to declines in populations.

The Montana Bighorn Sheep Conservation Strategy (MFWP 2010) identified major habitat issues. Those threats that could be affected by this proposal include: 1) forest succession or woody plant encroachment into former grasslands or shrub grasslands has resulted in a loss of habitat including linkages between habitats and subpopulations; and 2) noxious weeds have resulted in decreased productivity of seasonal ranges.

The overarching threat to maintaining healthy bighorn sheep populations is disease transmission from domestic sheep (WAFWA Guidelines 2007, 2010; MFWP 2010). The Montana Strategy is quite clear that separation from domestic sheep is a crucial concern (Transplant Section - MFWP 2010). The winter 2009-2010 Montana die-offs in Rock Creek to the west and Lost Creek to the east were all disease related (WAFWA 2010 Western Die-Off Summary). While there are an estimated 1,299 domestic sheep in Granite and Powell counties (NASS 2012), there are no FS sheep allotments anywhere on the Deerlodge portion of the

BDNF. The location of domestic sheep operations in the county is not specified. A statewide status review was conducted in May, 2010 by Montana FWP precipitated by the winter 2009-2010 die offs. That review maintained bighorn sheep at Category S4-Apparently secure, though it may be quite rare in parts of its range, and/or suspected to be declining (Maxell 2010).

Biological Information for Bighorn Sheep

Bighorn sheep are adapted to a wide variety of habitats but three elements are essential to quality habitat: (1) escape terrain; (2) high visibility; and (3) winter ranges are low-elevation, south-facing slopes, with escape cover in close proximity to foraging areas (MFWP 2010). Bighorn sheep forage opportunistically and utilize vegetation types that occur within their seasonal distribution. With few exceptions, bighorns utilize forbs heavily in the spring when they are readily available. As forbs desiccate during summer, diets switch to more grass and grass-like plants. Some populations make substantial use of browse species at certain times of the year (MFWP 2010).

While good habitat conditions are important for maintaining wild sheep, separation from domestic sheep is a recurring theme in the Montana Conservation Strategy and the WAFWA recommendations to Federal agencies.

Bighorn Sheep Habitat and Use of the Analysis Area

The Garrison herd utilizes a core area containing winter range and lambing habitat on private lands located about 3 miles east of the project area. The core area is separated from mountainous terrain on the BDNF by open intermountain grasslands and gradual benches descending from the Flint Creek Range (MFWP 2010). Occurrence of some ram groups and a few yews is reported for the higher mountains and rams have also been found in the western portion of the project area above Maxville and south of the project area at Powell Mine demonstrating long exploratory movements into the Flint Creek Range (figure 30).

The herd was first reported in the 1980s. As of 2008, the herd was estimated to total 65 animals (MFWP 2010). Mapped range of this herd in proximity to the project area is shown in Figure 22. This population did not experience a die-off event in the winter of 2009-2010 (WAFWA Summary 2010). About 18,283 acres of mapped bighorn sheep distribution occur within the project area.

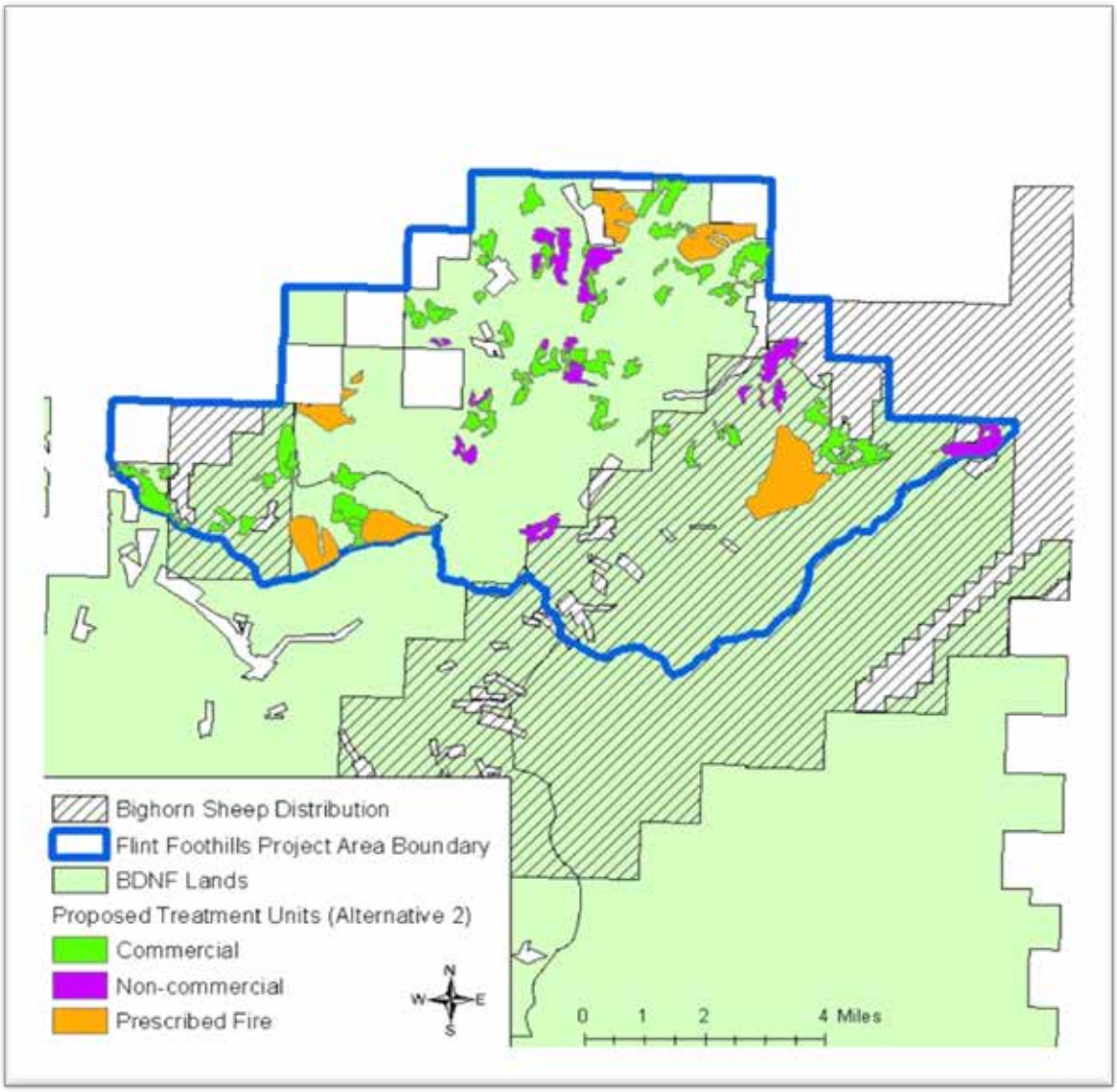


Figure 30. Bighorn sheep distribution in relation to the Flint Foothills project area

Risk factors identified for Garrison bighorn sheep herd include exposure to disease in domestic sheep and goats, forest succession or woody plant encroachment into former grasslands or shrub grasslands, development, and noxious weeds (MFWP 2010).

Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

For alternative 1, there would be no direct, indirect or cumulative effects to bighorn sheep or habitat because no project activities are proposed.

Alternatives 2 and 3

Direct and Indirect Effects

While proposed treatments are located within the distribution of bighorn sheep (Figure 22), treatments proposed under the action alternatives are located in forest environments, outside suitable bighorn sheep habitats. Project activities would not contribute to risk of disease transmission from domestic livestock and would not affect existing amounts or trends of forest succession into grassland or shrubland habitats.

There would be no project-related disturbance within fall secure areas. There is potential for disturbance by project activities if bighorns are utilizing areas adjacent to proposed treatment units when treatment occurs, but the potential for disturbance is low, and the duration would be short term.

Cumulative Effects

The cumulative effects area for this species is defined as the project area as well as lands within 2 miles of the project area located within mapped bighorn sheep distribution. The area encompasses 67,819 acres. Existing condition of bighorn sheep habitats in the project area are partially a function of past activities. Past road development has decreased wildlife security; wildfire suppression has allowed conifer encroachment into suitable foraging habitats.

Actions that might affect bighorn sheep and/or habitats within the project area are livestock grazing, weed control, and wildfire suppression. Livestock grazing and weed control are important actions affecting range condition. All FS allotments are under a rest-rotation grazing system; however, current range conditions within the project area are not identified. There are no domestic sheep allotments on the Deerlodge portion of the BDNF. Continued treatment of existing weed infestations with herbicides is expected to benefit habitat suitability for bighorn sheep. Wildfire suppression would reduce the potential for mortality of conifers encroaching into suitable foraging habitats.

On lands of other ownerships, timber harvest could affect secure areas on adjacent NFS land if additional roads are developed and accessible within 0.33 mile of NFS lands; however, the potential for, and location of, future road developments on non-NFS lands has not been identified. Salvage treatments on non-NFS lands would not occur in bighorn sheep suitable habitat. Livestock grazing on private lands and Montana State Prison lands outside of the BDNF and east of the project area would also continue. While there are an estimated 1,299 domestic sheep in Granite and Powell counties (NASS 2012), there are no Forest Service sheep allotments anywhere on the Deerlodge portion of the BDNF. The locations of private domestic sheep operations are unknown. The extent and location of noxious weed treatments on lands outside the BDNF is not described.

While present and reasonably foreseeable activities may affect bighorn sheep or habitats in the project area, no overlap of effects from the proposed activities is expected because activities proposed under the Flint Foothills project are located outside suitable bighorn habitats and would have minimal potential impact on wildlife security.

Summary of Effects

Based on the above analysis, implementation of either action alternative may impact individuals, but will not likely result in a trend toward federal listing or reduced viability of the population or species. Activities associated with the project may cause short-term avoidance by

individuals, but there would be no long-term changes in wildlife secure areas or habitat suitability.

Fisher

Overall Population and Habitat Status and Distribution

The present range of fishers is reduced from pre-European settlement times with most reduction occurring in the United States. Trapping and habitat loss appear to be the primary reasons. In 1959 fisher were released at Moose Lake on the Pintler RD of the BDNF (Vinkey 2003). Distribution maps of fisher in the western United States indicate that the BDNF is at the southernmost fringe of Montana's population (Montana Field Guide 2012). There is a lack of verified records for the Forest, but mature forest is widely available across the Forest that can provide habitat for fisher population expansion (USDA Forest Service 2009a). Since that time, fisher surveys have been conducted across the northern portion of the BDNF. No detections have been reported. The fisher had been petitioned for federal listing in the northern Rocky Mountains. In June 2011, the FWS released their 12-month finding that listing is not warranted at this time (USDI Fish and Wildlife Service 2011a).

Samson (2006) modeled habitat using basal area, potential vegetation type, dominance group and canopy cover. He found that habitat was well-distributed across the Northern Region and Forests. He also found that it was impossible to model large down woody debris from the existing data and that incorporation of this may or may not influence habitat estimates.

ERG (2010) reported that mesic forests are inherently rare on the BDNF and fisher detection is limited to the northwest corner of the Forest. Stands comprising potential habitat are largely within the spruce/fir cover types and are not vulnerable to mountain pine beetle. The modeling estimated a total of 135,417 acres of fisher habitat on the Forest.

Fisher hare-snare surveys according to Rocky Mountain Research Station protocol (Schwartz et al. 2006) were completed across the northern portion of the BDNF in 2007, 2008, and 2010, however to-date, no fishers have been detected.

Biological Information for Fisher

Fishers prefer dense late-successional stands with high canopy cover. Bush and Lundberg (2008) identified fisher suitable habitats as a variety of forested types with stands greater than 9 inches d.b.h. and canopy closure greater than 40 percent. High canopy cover, fallen logs, stumps, and seedlings, shrubs and herbaceous cover are important. Overall, fishers clearly avoid nonforested areas, large forest openings, recent clearcuts, and areas above timberline (Fisher survey protocol, Schwartz et al. 2006).

Riparian areas are especially important in all seasons (USDA Forest Service 2009b). Dens are found in dead or living tree cavities and in hollow logs. Fishers appear to be restricted to areas with relatively low snow accumulation. Deep fluffy snow and thin crusts restrict their movement (Ruggerio et al 1994). Where snow is deep, fishers may forage for hares on packed, snowplow drifts along roads that bisect hare habitat (in Ruggerio et al. 1994). Currently, mature forest is widely present across the Forest (USDA Forest Service 2009b). Fishers are more common where density of humans is low and human disturbance is reduced (USDA Forest Service 2009b).

Fisher Habitat and Use of the Analysis Area

Based on information in table 40, there are approximately 19,631 acres of lodgepole pine, Douglas-fir, or subalpine fir forest types averaging 10 inches d.b.h. or greater on BDNF lands within the project area. Much of the larger diameter lodgepole pine trees are dead or dying due to mountain pine beetle activity, and suitability for fisher is limited due to their preference for higher canopy cover. Stands are currently very open (low canopy cover) with little understory vegetation and are being converted to early-successional stages. Because much of the lodgepole pine forest is already converting to early-successional stages, it would be more than one hundred years before a mature, dense, high canopy cover forest reoccupies those sites. Review of the vegetation data shows that suitable stands (10 inches or greater d.b.h., greater than or equal to 40 percent canopy closure) in Douglas-fir and subalpine fir total 6,576 acres.

Due to the low number of verified records for the Forest despite surveys, the project's distance from the last relocation efforts (32 miles to the south at Moose Lake (Vinkey 2003) and lack of records for the BDNF, it is unlikely that fishers are present in the project area.

Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

For alternative 1, there would be no direct, indirect or cumulative effects to fisher or fisher habitat from the Flint Foothills Vegetation Management Project because no project activities are proposed.

Alternatives 2 and 3

Direct and Indirect Effects

Currently, the stands likely suitable for fishers consist of Douglas-fir and subalpine fir 10 inches d.b.h. or greater with canopy closures greater than or equal to 40 percent. Review of the vegetation data shows a total of 6,576 acres of suitable habitat on NFS lands within the project area. Alternative 2 would treat 1,149 acres, or 17 percent of suitable habitat via commercial thinning in Douglas-fir stands. Alternative 3 would treat less, with a total of 666 acres of commercial thinning that amounts to about 10 percent of existing suitable. Residual canopy closures in commercially-thinned stands are expected to range from 20-50 percent in treated stands (1,028 acres under alternative 2); therefore, a portion of treated stands will contain canopy closures below those identified as suitable for fishers.

Commercial thinning treatments may also include salvage of lodgepole pine in some units. Removal of dead lodgepole pine would decrease future accumulations of downed logs that could contribute to stand suitability for fishers as described by Bull et al. (2001). Adherence to Forest Plan snag and downed log standards is expected to maintain habitat for associated species in the project area.

Prescribed burning in mid-elevation lodgepole pine stands will likely have little impact on fisher habitat due to existing levels of tree mortality.

ERG (2010) modeled fisher habitat in the northern portion of the BDNF and estimated that at the forest scale only 6 percent of forested acres meet the criteria as suitable for this species. Modeling of both nontreatment and treatment scenarios indicates that fisher habitat in the Clark

Fork-Flints landscape is predicted to increase by 4 percent and 11 percent under the no-treatment and treatment scenarios, respectively in the 50-year modeling period (table 53). Projected accelerated increases under the treatment scenarios are due to (1) a slightly negative effect from stand simplification that removes snags and coarse wood on treated acres, and (2) reduction in fire severity within the analysis area. Based on these results, fisher habitat is expected to continue to be available in the Clark Fork-Flints in both a treated and untreated landscape.

Table 53. Modeled acres of potential fisher habitat for alternatives 2 and 3 from 2010 to 2060

Clark Fork-Flints	2010	2020	2030	2060
No Treatment	135,417	143,442	149,591	140,482
Treatment	135,417	142,972	155,837	152,829

(source: ERG 2010)

Cumulative Effects

Fisher home range size for females average about 6,000 acres in the Rocky Mountains (Schwartz et al. 2006). Therefore, the primary cumulative effects analysis area is the project area. In addition, vegetation condition at the landscape scale is considered here in order to interpret habitat trends and implications over a broad area.

Past fire suppression actions have led to present day dense stands of Douglas-fir estimated to exceed historical amounts. There are no ongoing or foreseeable projects that are expected to affect availability of mature Douglas-fir stands. Most firewood cutting occurs in lodgepole pine (abundant and easier to cut and split). Wildfire suppression at lower elevations where most Douglas-fir stands occur decreases the potential for loss of dense habitat structure, but maintains uncharacteristic fire return intervals in stands where long-term sustainability of dense forest structure may not be possible. Trapping in Montana is managed by MFWP. The analysis area is located in Trapping District 2, within which the trapping quota is five fishers per year (MFWP 2012). Given the lack of known fisher occurrence, trapping is unlikely. A reduction in fisher suitable habitat within the project may slightly increase trapping effort, if occurring, in nontreated stands; however, no increased trapping access would result. Based on the above analysis, cumulative effects of the reduced canopy closure under the action alternatives combined with effects generated by trapping and wildfire suppression are expected to be minor and not quantifiable.

Summary of Effects

Given the lack of recorded fisher observations, the potential for fisher occurrence within the project area is low. Suitable habitat is available in dense Douglas-fir and subalpine fir stands. Both action alternatives would treat suitable Douglas-fir stands resulting in modest reductions (less than 20 percent) in available habitat post-treatment. Trapping within the project area is unlikely and no increased access to trapping would occur. Therefore, activities proposed under both action alternatives may affect individuals or habitat but will not likely result in a trend toward federal listing or reduced viability of the population or species.

Gray wolf

Overall Population and Habitat Status and Distribution

The gray wolf was previously listed as threatened on the northern part of the BDNF (north of I-90 and west of I-15) and experimental, nonessential over the rest of the Forest. Since that time they have been delisted (USDI Fish and Wildlife Service 2011b) and are now on the Regional sensitive species list.

Gray wolves are habitat generalists. They generally use areas that lack human disturbance (corresponding to low road densities) and have abundant prey (primarily elk). At the end of 2006, there were estimated to be 12 wolf packs found on the Forest, ranging in size from 2 to 8 wolves (USDA Forest Service 2009b). By the end of 2010, there were approximately 13 packs on or partially using the BDNF (Sime et al. 2011).

Biological Information for Gray Wolves

Packs generally consist of a socially dominant pair, their offspring of the previous year, and new pups. Pack size varies and may include as few as 3 and as many as 37. Breeding usually occurs only between the dominant pair. Young are born in late April in an underground burrow that has been abandoned by other mammals or dug by wolves. Young vacate the den when they are about 3 months old and move to a series of rendezvous sites throughout the packs territory. Pack activity is centered around the den site and nearby rendezvous sites from late April until September.

In Montana, deer, elk and moose make up the majority of wolf diets. Smaller mammals can be an important alternative to large game in the snow-free months. Wolves die from a variety of causes: malnutrition, disease, injuries, interpack aggression and human factors. Human factors accounted for 87 percent of reported wolf mortality in southwestern Montana based on carcass analysis from 2007-2010 (Sime et al. 2011).

Gray Wolf Habitat and Use of the Analysis Area

The Flint Creek wolf pack was first documented in 2007. Its territory is located at the north end of the Flint Creek Range. The pack contains at least two wolves, not identified as a breeding pair. Sightings in 2010 were reported from the prison ranch area west of Deer Lodge through Gold Creek and Douglas Creek. No depredations have been attributed to this pack (Sime et al. 2011).

Environmental Consequences

Measures for potential effects to wolves include sufficient, year round prey base (elk); suitable and somewhat secluded denning and rendezvous sites (wet meadows); and sufficient space with minimal exposure to humans. There are no known den or rendezvous sites in the project area and this measure will not be addressed further, except as provided by secure areas. This species is classified as sensitive across the entire Forest as a result of the latest final rule (USDI 2011b) delisting the Northern Rocky Mountains population. The Flint Creek pack is mapped as occurring in the project area (Sime et al. 2011).

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

For alternative 1, there would be no direct, indirect or cumulative effects to grey wolves or habitat from the Flint Foothills Vegetation Management Project because no project activities are proposed.

Big game species present across the project area include elk, mule deer and moose. This mix of species provides a good year-round prey base for wolves. See the elk analysis in the MIS section for more information on prey base.

Secure area direction in the Forest Plan was developed to provide secure habitat for all wildlife species, including elk and wolves. Currently, OMRTD direction is being met during the summer (measured by OMRTD over the landscape, and fall hunting season measured over the hunting unit (table 45).

The area would continue to provide habitat as discussed in the existing condition section. Selection of this alternative would have no impact on this species or habitat.

Alternatives 2 and 3

Direct and Indirect Effects

This proposal would result in changes to stand structure and species composition through clearcut salvage, thinning, and precommercial thinning. Wolves are not associated with particular forest stand structures, so the vegetation treatment proposals effects on vegetation will not be analyzed.

Implementation of this proposal would include disturbance effects (temporary displacement) due to increased traffic, human activity, and equipment use during project activities.

Most big game species are present across the project area, including elk, mule deer and moose. This mix of species provides a good year-round prey base for wolves. Elk are a MIS in the Forest Plan and Plan direction is being met as discussed below. In addition, there are specific mitigations that have been added to address concerns. See the elk analysis in the MIS section for more information on prey base.

Secure area direction in the Forest Plan was developed to provide secure habitat for all wildlife species, including elk and wolves. Currently, secure area direction is being met during the summer (measured by OMRTD over the landscape (table 45 and table 47). This provides secure areas during the spring and summer season and denning period. Plan direction (goal) is also being met during the fall hunting season (measured by OMRTD over the hunting unit (table 45).

Both action alternatives propose maintenance and reconstruction of existing roads, new and temporary road construction as well as reconstruction and use of existing unauthorized routes. The action alternatives would not result in increased OMRTDs post-project and open-road densities would remain consistent with Forest Plan guidance (table 45 and table 47).

During project implementation, existing travel restrictions would be followed with exceptions where roads are currently closed year-round. Roads closed year-round include NFS roads 19752, 78472, and 78476 that access units 44S, 58S, and 69S under both action alternatives.

Use of these roads for project implementation during the summer season would increase disturbance on 462 acres of existing summer security habitat under both action alternatives. All units accessed or located in fall secure areas would be restricted during that period under both action alternatives (wildlife project design features and mitigation measures, chapter 2).

Under alternative 2, new temporary roads that would access units 48C, 55C, 56C, 57C, 68C, and 71C are located in existing summer security habitat, or within 0.33 mile of summer security habitat. Use of these roads in the summer season during implementation would produce short-term disturbance on approximately 354 acres of summer security habitat. New NFS road construction designed to access units 36S and 47S would produce short-term disturbance on an additional 72 acres of summer secure habitat during implementation. Total area of summer security habitat affected by short-term disturbance is about 816 acres for alternative 2.

For alternative 3, no short-term disturbance would occur in summer security habitat as a result of new temporary roads or new NFS road construction. Total area of summer security habitat affected by short-term disturbance is about 462 acres for alternative 3.

Alternative 2 reduces the amount of open road by 0.6 mile, but has no appreciable effect on road density at the landscape and hunting unit scales. All temporary roads would be decommissioned upon completion of project activities; newly constructed temporary roads would be obliterated; existing temporary roads would be decommissioned primarily with signs and berms. Units and roads that are in fall secure areas are shown in figure 26. Mitigation has been added to comply with existing travel restrictions (Wildlife project design features and mitigation measures, chapter 2), and there would be no activities in fall secure areas during the hunting season when human disturbance activities are the greatest.

Cumulative Effects

The cumulative effects analysis area for wolves is defined as portions of Hunting Unit 212 occurring within the Boulder Creek, Lower Flint Creek, and Clark Fork-Gold Creek 5th-level HUCs, extending out 2 miles from the BDNF administrative boundary. This area totals 147,215 acres which exceeds average wolf territory size described by Sime et al. (2011). A review of the ongoing and foreseeable actions for actions that might affect prey or secure areas (areas with minimal human disturbance) on NFS lands found that only travel analysis would have the potential to affect wildlife secure areas, but the decisions and associated effects are unknown at this point in time. Travel analysis would consider wildlife secure areas and effects during that process.

Lands of other ownership within the cumulative effects analysis area include those under BLM, State of Montana, and private ownership. Past, present, and reasonably foreseeable activities on these lands include livestock grazing and/or timber harvest. On Montana DNR lands in the Douglas Creek area, and on Montana State Prison lands, timber harvest could affect secure areas on adjacent NFS land if additional roads are developed and accessible within 0.33 mile of NFS lands; however, the potential for, and location of, future road developments on lands of other ownership is not identified. Because the distance of effect is 0.33 mile, the potential impacts to wolves and secure habitats at the project-level are minor.

Therefore, temporary disturbance effects from other activities on NFS lands and on lands of other ownership, combined with effects generated by the action alternatives would have minor impacts to wolves.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The wolf Biological Opinion for the Forest Plan applied to the area of the BDNF where the wolf was listed as threatened, and does not apply here. Prior to delisting (USDI 2011b) the project area was included in the nonessential/experimental zone and not within the "threatened" zone. With the delisting of the Northern Rockies population (USDI 2011b) the terms and conditions do not apply anywhere on the BDNF.

The numerical OMRTD direction is a goal in the Forest Plan. The landscape and HU212 meet the goal. The standard that addresses this issue is Standard #1, which states "from October 15 to December 1 Hunting Units that exceed the OMTRD objective will have no net increase." Existing OMRTDs are currently below thresholds stated in the Forest Plan. This project does not result in a net increase (post-project) that exceeds the Forest Plan standard, as shown in table 45 and table 47.

Summary of Effects

Based on the above analysis, selection of either action alternative may affect individuals (temporary displacement) or habitat but will not likely result in a trend toward federal listing or reduced viability of the population or species.

North American Wolverine

Overall Population and Habitat Status and Distribution

In December 2010, the US Fish and Wildlife Service announced a 12-month finding on a petition to list the wolverine under the ESA (USDI FWS 2010b). They found that listing was warranted but precluded, making it a candidate species. They concluded that the impact of climate change constitutes a threat to the contiguous United States distinct population segment of the wolverine. Wolverine populations in the remaining U.S. range appear to be at numbers so low that their continued existence is at risk due to (1) small total population size; (2) effective population size below that needed to maintain genetic diversity and demographic stability; and (3) the fragmented nature of wolverine habitat. These risks are secondary and only rise to the level of threats to the distinct population segment as they may work in concert with climate change.

Impacts to habitat included (1) climate change; (2) human use and disturbance; (3) dispersed recreational activities; (4) infrastructure development; (5) transportation corridors; and (6) land management. The primary impact of climate change is expected to be through changes in availability and distribution of wolverine habitat (areas with persistent spring snow).

Historically in the lower 48 states the wolverine once inhabited forests from Maine to Washington and south along the Rocky Mountains into Arizona and New Mexico. Trapping in the late 1800s and early 1900s decreased numbers and distribution. Today, the last remaining stronghold in the lower 48 states is in western Montana and parts of Idaho. Wolverines occur at naturally low densities of about one wolverine per 58 square miles with a reported range from one per 25-130 square miles (Squires et al 2007). No systematic population census exists over the entire current range of wolverines in the contiguous United States, so the current population level and trends remain unknown. However, based on current knowledge, the USFWS estimates that the wolverine population in the contiguous United States numbers approximately 250 to 300 individuals (USDI Fish and Wildlife Service 2010, pg. 78031). Wolverines occur on the BDNF but total populations are unknown. While virtually all of the BDNF landscapes have

wolverine detections; the Pioneer, Anaconda-Pintler and North Flint mountains appear to have the most vigorous populations (USDA Forest Service 2009b).

Squires et al. (2006) detected a total of 22 wolverines in the 4 mountain ranges (Pioneer, Beaverhead, Flint Creek and Anaconda-Pintler) comprising the Pioneer study area from 2002-2005. A portion of one home range overlapped the Flint Foothills project area (figure 31).

The average home range for adult males and females with greater than 20 locations were 648 sq. mi. (n=4) and 211 sq. mi. (n=4), respectively. The home range of one adult male overlapped the Clark Fork-Flints landscape, and appears to overlap the project area (figure 31, Squires et al. 2006). Long distance movements of wolverines were most commonly associated with dispersal of young individuals (Squires et al. 2006).

The Wildlife Conservation Society (WCS) has ongoing wolverine research across the region. Inman et al. (2008) postulates a Central Linkage Ecosystem (CLE) for wolverines. The ecosystem is comprised of several mountain ranges located between core habitat areas and is proposed as being critical for wolverine persistence. The analysis area lies in the Anaconda deme (unit) of the CLE (Inman et al. 2008) as shown in figure 32. Dispersal through this vast CLE is yet to be documented.

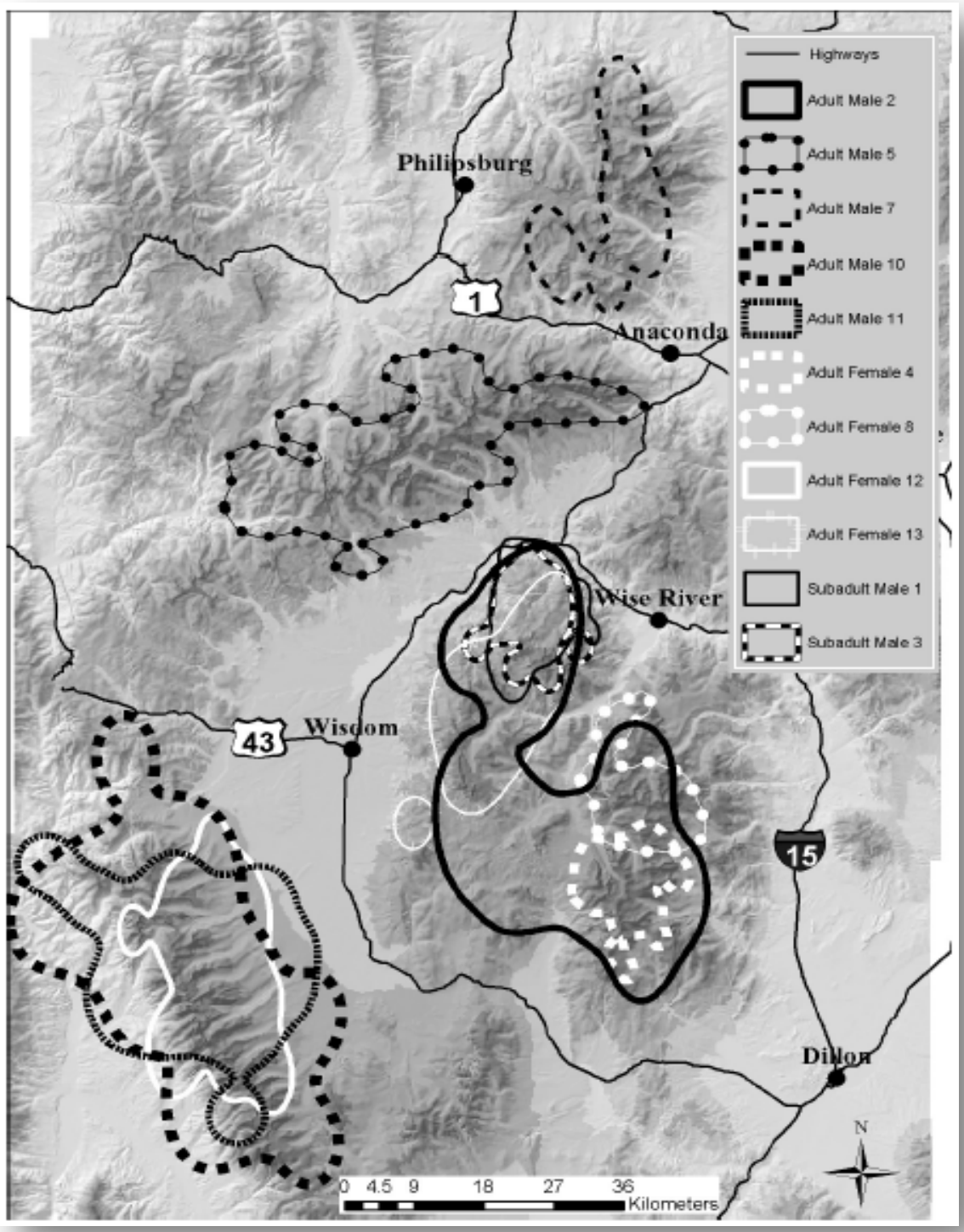


Figure 31. Spatial arrangement of wolverine home ranges in southwest Montana during 2002 and 2003 (Squires et al. 2006)

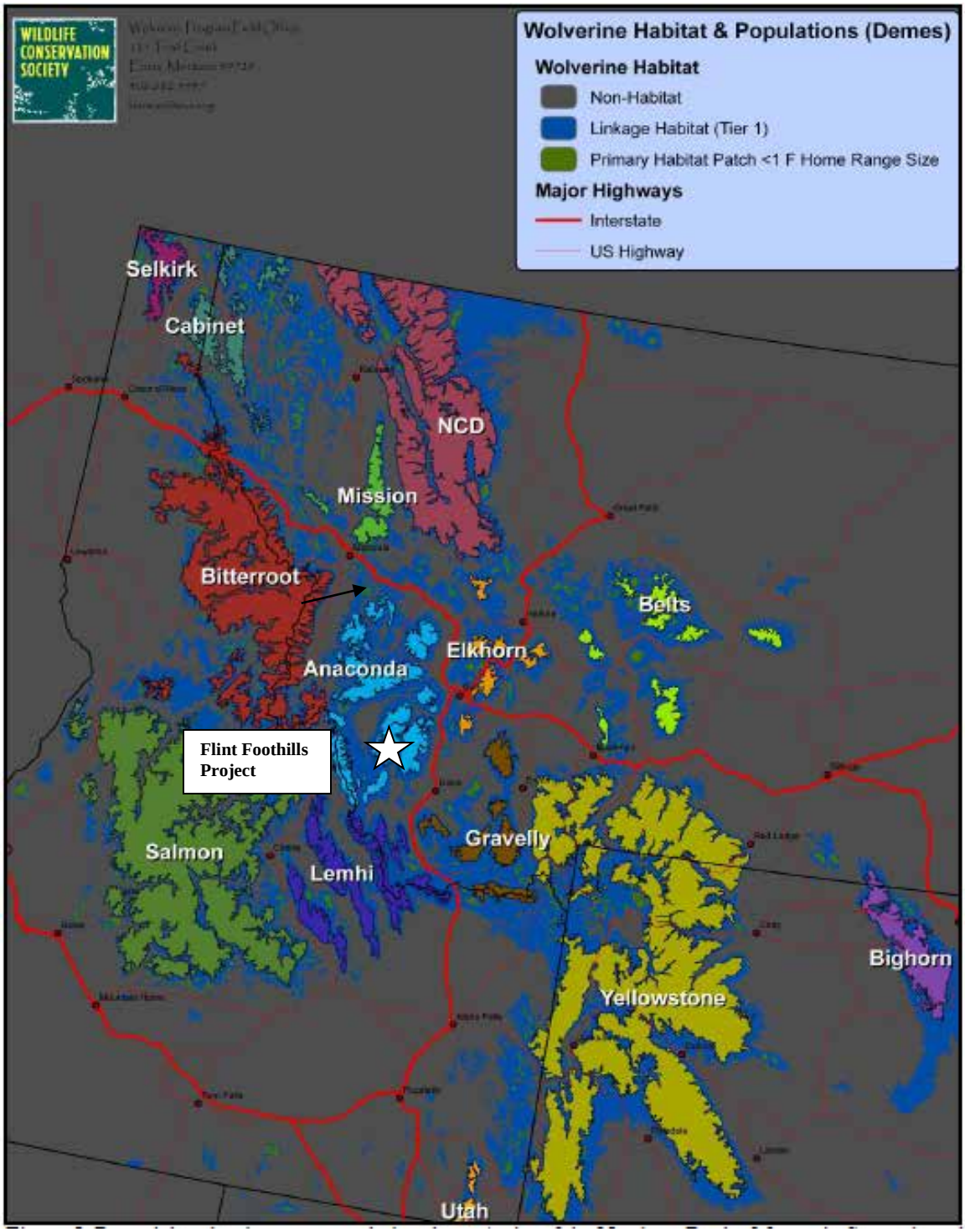


Figure 32. Wolverine Demes (Inman et al. 2008)

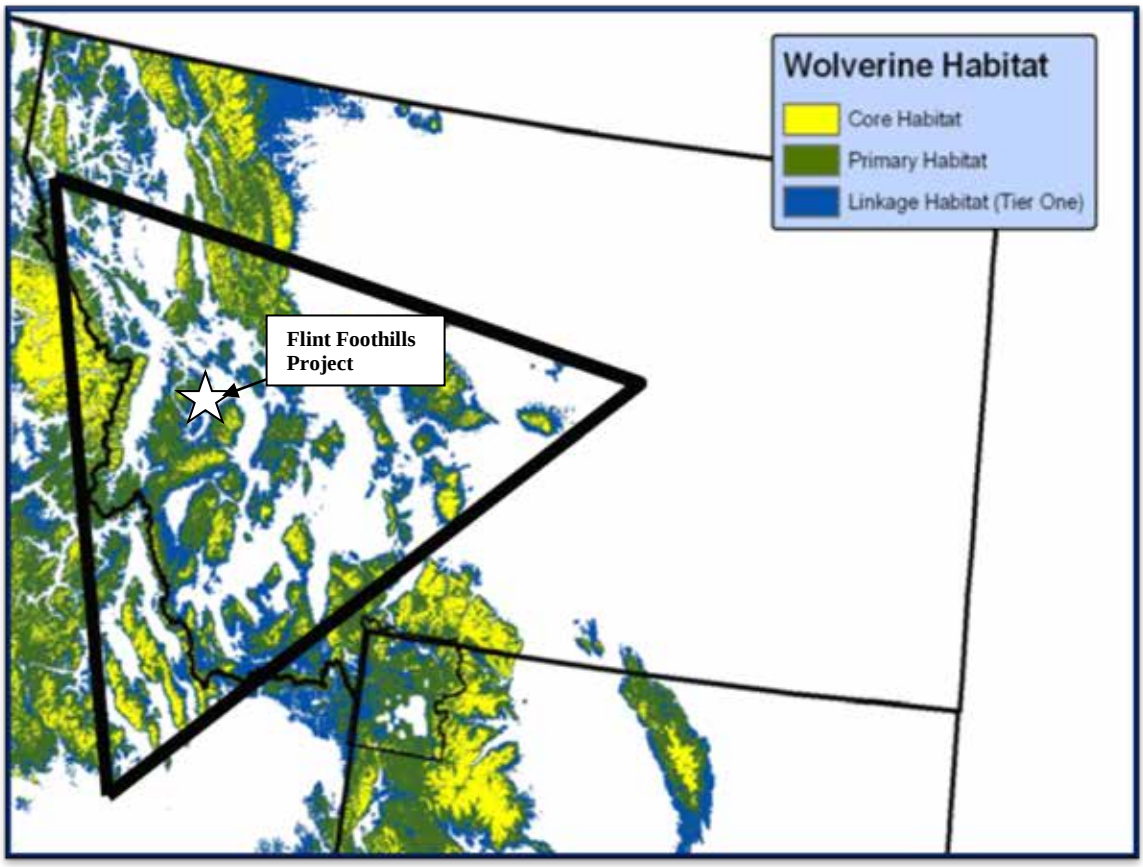


Figure 33. Wolverine Central Linkage Ecosystem (Inman et al. 2008)

As stated in the 12-month finding (USDI Fish and Wildlife Service 2010, pg. 78035) "…trapping is no longer a threat within most of the wolverine range in the contiguous U.S. Montana is the only state where wolverine trapping is still legal". MFWP changed wolverine trapping regulations in 2008. This has increased geographic control of harvest to prevent concentrated trapping in any one area and to completely stop trapping in isolated mountain ranges. No wolverine harvest was reported statewide in 2010 (Montana FWP Harvest Report). In order to achieve dispersal and gene flow among core population centers, wolverines are protected in the Central Insular Mountains, which includes the Anaconda deme (and includes the Flint Creek Mountain Range and the project area).

Biological Information for Wolverine

Wolverines are generally solitary and wide-ranging. They occur at relatively low densities; current population levels and trends are unknown. Wolverine habitat can be characterized by deep, persistent and reliable, spring snow cover (April 15 to May 14) and is the best overall predictor of wolverine occurrence in the contiguous U.S. (USDI Fish and Wildlife Service, 2010b pg. 78035). The high elevations provide deep and persistent snow cover necessary for the presence and maintenance of late-winter reproductive dens (Aubry et al. 2007, Copeland et al. 2010). Copeland et al. (2010) overlaid known den sites on the spring snow coverage and 97.9 percent of the den sites occurred in pixels that were snow-covered in at least 1 of 7 years. Ninety-five percent of summer locations and 86 percent of winter locations fell within the area of persistent spring snow. In the southern part of their range (which includes Montana), wolverines move up in elevation in summer to avoid high summer temperatures. McKelvey (R1

Regional Biologist Meeting, December 2010) stated that wolverines are 20 times more likely to stay in the area of persistent spring snow during dispersal.

In Montana, natal dens occur above 7,874 feet and are located on north aspects in avalanche debris, typically in alpine habitats near the timberline. Dens are typically used through late April or early May and after using natal dens, wolverines use rendezvous dens through early July. These sites are characterized by natural cavities formed by large boulders, downed logs (avalanche debris) and snow (USDI Fish and Wildlife Service 2010, pg. 78031). When known den sites were overlaid with areas of persistent spring snow, 69 percent of the dens were located in areas with persistent spring snow 6 to 7 years out of 7 (Copeland et al. 2010).

Protection of natal denning habitat from human disturbance may be important. The 12-month finding (USDI FWS 2010a) found that wolverine can coexist with some level of human disturbance and habitat modification. The proximity of wolverine habitats to areas heavily or moderately used for dispersed recreation needs more study, especially where the overlap is during the denning season.

A denning habitat model was developed during Forest Plan revision, based on Heinemeyer et al. 2001. This model incorporated slope, elevation, cover types and patch size. Forestwide there is good correlation between modeled denning habitat and the Copeland (2010) persistent snow model (BDNF Habitat Query 2011).

At the forest scale, summer and winter nonmotorized areas were established across the Forest. Wolverines and modeled denning habitat were one of the criteria used to select winter nonmotorized areas. These areas were selected forestwide; one area was selected in the north Flint Creek Mountain Range. The Plan restricts winter motorized use on over 70 percent of the modeled wolverine denning habitat within the BDNF (USDA Forest Service 2009b).

Because wolverine habitat in the Rocky Mountains is not contiguous, wolverines need linkage zones to move between areas of suitable habitat. Wolverines prefer to travel in habitat that is most similar to habitat they use for home range establishment. The level of development in linkage zones that wolverines can tolerate is unknown, but it appears that the current landscape does allow for wolverine dispersal (USDI Fish and Wildlife Service 2010b).

Wolverine Habitat and Use of the Analysis Area

The analysis for direct and indirect effects is the project area. This encompasses all the proposed actions that could affect potential habitat on NFS lands in the mountain range. Modeled denning habitat is located at higher elevations in the southern portion of the project area. Persistent spring snow is a main characteristic required for winter denning. Spring snow persistence (Copeland et al. 2010) and modeled denning habitats are shown in figure 34

While the project area has a generally moderate quantity of habitat based on at least 1 year with available snow, quality is lower due to having limited areas where there is persistent spring snow 6-7 years out of 7 as shown in table 54. The areas to the south (central Flint Creek Range) contain larger more contiguous habitats (figure 34). Fall secure areas would provide habitat connectivity within the mountain range and project area.

Table 54. Acres of potential wolverine habitat based on persistent spring snow (Copeland et al. 2010)

Years Out of 7 with Persistent Spring Snow	Acres in Project Area*	Percent of Project Area
1	2,702	6.1
2	5,895	13.2
3	2,530	5.7
4	2,024	4.5
5	431	<1
6	737	1.7
7	0	0

Wolverines are difficult to detect due to low densities, small population size and remote habitats (Squires et al. 2006). Specific surveys were not done for wolverines in the project area. They are known to occur in the Flint Creek Range. Winter use monitoring (2010) of nonmotorized allocations in the North Flints showed no incursions into modeled wolverine denning habitat (Wildlife Conservation Society 2010 unpublished report).

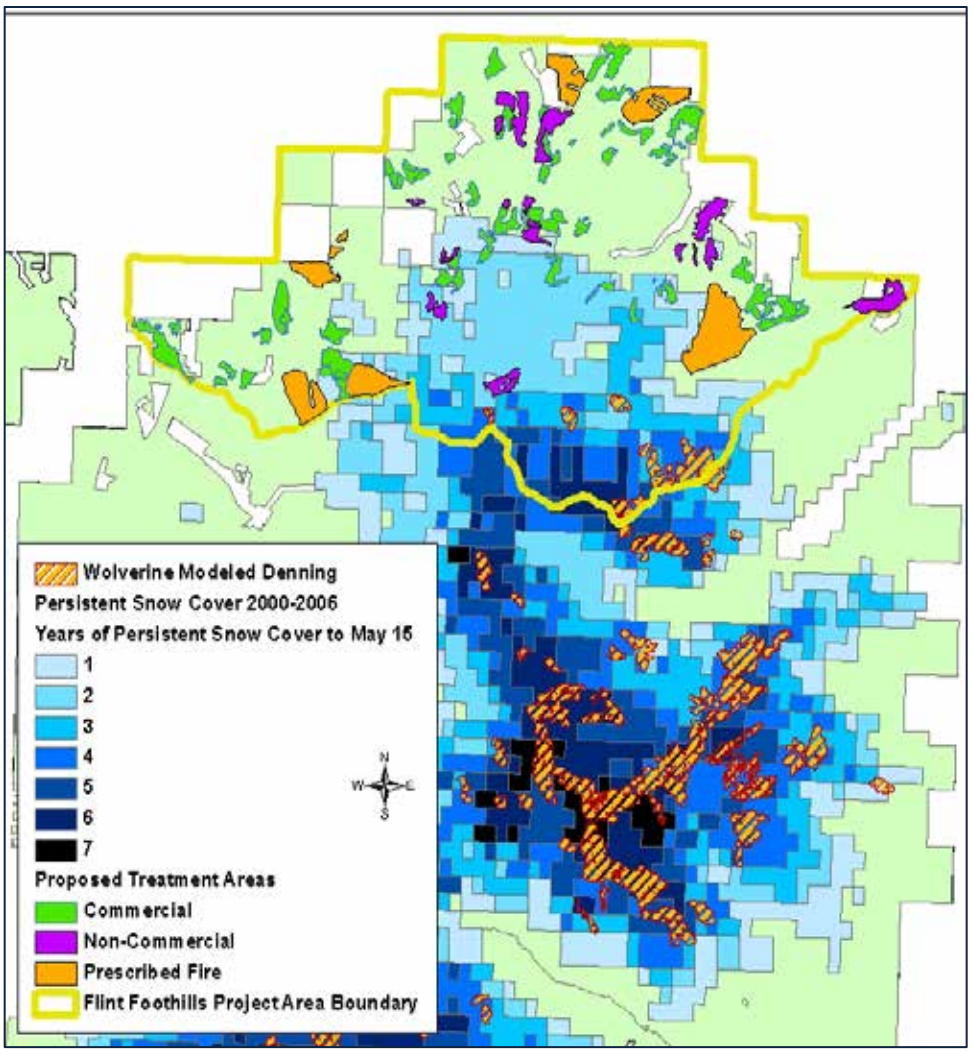


Figure 34. Wolverine modeled denning and persistent spring snow (Displays years out of 7 with spring snow cover (2000 to 2006).

Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

For alternative 1, there would be no direct, indirect or cumulative effects to wolverines or habitat from the Flint Foothills Vegetation Management Project because no project activities are proposed.

Alternatives 2 and 3

Direct and Indirect Effects

Habitat and Elevation

Availability of areas with persistent snow cover largely determines suitability for wolverine use. Copeland et al. (2007, 2010) clearly equate the association of persistent spring snow and higher elevations (greater than7800 feet) with wolverine distribution. They found that 95 percent of summer and 86 percent of winter telemetry locations were concordant with spring snow coverage. They also reported that in seven of eight North American study areas, and in southern Norway, wolverines selected for areas within the spring snow coverage during winter, summer, and when seasons were pooled, and that elevation explained use of habitat better than any other variable in both summer and winter.

Copeland et al. (2007) state elevation was the key variable for distinguishing wolverine presence. Wolverines preferred higher elevations in almost all models in which it was present. Use of high elevation was most notable during summer when all elevations greater than 7,874 feet were used more than expected and elevations less than 7,218 feet were used less than expected. During winter, use shifted to 7,872-8530 feet elevation zone with lower elevations used less than expected.

Approximately 8,865 acres (20 percent of the project area) occur at or above 7,218 feet elevation. About 2,719 acres (6 percent) are at or above 7,872 feet elevation, and 1,119 acres (3 percent) are at or above 8,530 feet. Under the proposed action, 405 acres of treatment consisting of commercial harvest, precommercial thinning, and prescribed burning would occur between 7,218 – 7,872 feet. Alternative 3 would treat slightly less (table 55). Virtually no treatments would occur above 7,872 feet elevation; therefore, there is little or no potential for disturbance to wolverines during the winter period. Activities conducted on 405 acres under alternative 2 and 394 acres under alternative 3 during the summer at elevations above 7,218 feet have the potential to overlap with wolverine occurrence and may cause short-term avoidance by the species.

Table 55. Acres of proposed treatment within upper elevation bands

Alternative	Elevation		
	7,218 feet	7,872 feet	8,530 feet
Proposed Action	405 ac	<1 ac	0
Alternative 3	394 ac	<1 ac	0

Wolverine use of the project area below 7,812 feet is unlikely. Evidence for the avoidance of low-elevation areas regardless of human presence has been reported for western North America and Norway (May et al. 2006; Copeland et al. 2007). Low-elevation, xeric habitats in the western U.S. that provide winter range for ungulates were avoided by radio- marked wolverines, even though they contained an abundant food source (Copeland et al. 2007 in Copeland et al. 2010).

Snow Persistence and Denning Habitat

Level of snow persistence within the project area is shown in table 56. Overlap of proposed treatments on snow persistence is shown in table 57. No treatments are proposed in areas with 5 or more years of snow persistence. The project area contains a moderate amount of area with snow present through the denning period at least 1 year out of 7 (figure 34); where there is persistent spring snow 6-7 years out of a 7-year occurrence is sparsely available at the highest elevations. No treatments are proposed in areas with 5 or more years of snow persistence.

Most of the units lie in areas where snow is present during the denning season for only 1-2 out of 7 years, and all treatment units, except unit 39P are more than 1 mile from modeled denning habitat (table 57). All units except 36P and 39P are more than 1 mile from areas where there is persistent snow 6 out of 7 years (where most dens occur according to Copeland et al. 2010). Both units 36P and 39P are outside existing summer secure areas. Unit 36P is within a fall secure area, but would be treated outside the fall season. Therefore, while treatment activity is proposed within 1 mile of wolverine habitat, the potential for disturbance is minimal because treatments would occur when and where there is existing human access. No winter logging is proposed.

Table 56. Acres of potential wolverine habitat based on persistent spring snow (Copeland et al. 2010) and acres of proposed treatment for those acres by alternative

Years out of 7 with persistent spring snow	Acres in project area	Percent of project area	Treatment Type/ Acres (Proposed Action)	Treatment Type/ Acres (Alternative 3)
1	2,702	6%	Commercial – 275 Precommercial – 101 Prescribed fire – 272	Commercial – 134 Precommercial – 101 Prescribed fire – 272
2	5,895	13%	Commercial – 172 Precommercial – 131 Prescribed fire - 112	Commercial – 81 Precommercial – 131 Prescribed fire - 112
3	2,530	5%	Commercial – 21 Precommercial – 6 Prescribed fire - 1	Commercial – 21 Precommercial – 6 Prescribed fire - 1
4	2,024	5%	Precommercial - <1	Precommercial – <1
5	431	<1%	0	0
6	737	2%	0	0
7	0	0	0	0
Total	**13,318**	**34%**	**1,090**	**859**

Table 57. Units and treatments within areas of persistent spring snow, grouped by proximity to habitat

Unit	Treatment	Season of Activities	Years of Persistent Spring Snow out of 7 years	Alternatives	Distance to Modeled Denning Habitat	Distance to Areas of Persistent Spring Snow 6-7 Years Out of 7
3B	Prescribed fire		1	2, 3	3.6 mi	3.0 mi
4B	Prescribed fire		1, 2, and 3	2, 3	2.3 mi	1.5 mi
13P	PCT		1	2, 3	3.5 mi	2.8 mi
14P	PCT		1	2, 3	3.9 mi	3.1 mi
16P	PCT	Outside of fall hunting season	1 and 2	2, 3	3.5 mi	2.7 mi
17P	PCT	Outside of fall hunting season	1	2, 3	3.5 mi	2.7 mi
25P	PCT	Outside of fall hunting season	1 and 2	2, 3	2.6 mi	1.8 mi
36P	PCT	Outside of fall hunting season	1 and 2	2, 3	1.1 mi	0.7 mi
36S	Salvage	Outside of fall hunting season	1, 2, 3, and 4	2	2.8 mi	2.2 mi
39P	PCT		1	2, 3	0.9 mi	0.2 mi
39S	Salvage	Outside of fall hunting season	1 and 2	2, 3	2.2 mi	2.9 mi
40S	Salvage	Outside of fall hunting season	2 and 3	2, 3	2.9 mi	2.1 mi
44S	Salvage	Outside of fall hunting season	1	2, 3	2.2 mi	1.3 mi
45P	PCT	Outside of fall hunting season	2	2, 3	2.9 mi	2.0 mi
45S	Salvage		1 and 2	2, 3	2.5 mi	1.7 mi
47S	Salvage	Outside of fall hunting season	2	2	2.8 mi	2.1 mi
48C	Comm. thin	Outside of fall hunting season	1 and 2	2	3.3 mi	2.5 mi
49S	Salvage		1 and 2	2, 3	3.3 mi	2.6 mi
50S	Salvage		1	2, 3	3.7 mi	3.0 mi
58S	Salvage	Outside of fall hunting season	1 and 2	2, 3	2.7 mi	1.9 mi

Unit	Treatment	Season of Activities	Years of Persistent Spring Snow out of 7 years	Alternatives	Distance to Modeled Denning Habitat	Distance to Areas of Persistent Spring Snow 6-7 Years Out of 7
61S	Salvage	Outside of fall hunting season	1	2, 3	3.7 mi	3.1 mi
69S	Salvage		2	2, 3	2.9 mi	2.1 mi
77S	Salvage	Outside of fall hunting season	1	2	3.4 mi	2.7 mi
78S	Salvage	Outside of fall hunting season	1	2	3.7 mi	3.0 mi

Areas to the south of the project area (central Flint Creek Range) contain larger more contiguous habitats (figure 34). Current levels of summer and fall secure areas would be maintained post-project and would continue to provide habitat connectivity within the mountain range and project area. Maintenance of secure areas would also result in no increases in levels of human use and disturbance risk factors during the fall, winter, and spring seasons. Post-project, 19 percent of the project area would provide summer wildlife secure areas, and in the fall 41 percent of the project would provide fall secure areas. This is unchanged from the existing condition. During project implementation, existing travel restrictions would be followed with exceptions where roads are currently closed year-round. Roads closed year-round include roads 19752, 78472, and 78476 that access units 44S, 58S, and 69S under both action alternatives. Use of these roads for project implementation during the summer season would increase disturbance on 462 acres of existing summer security habitat under both action alternatives. All units accessed or located in fall secure areas would be restricted during that period under both action alternatives (wildlife project design features and mitigation measures, chapter 2).

Under alternative 2, new temporary roads that would access units 48C, 55C, 56C, 57C, 68C, and 71C are located inside or within 0.33 mile of existing summer security habitat. Use of these roads in the summer season during implementation would produce short-term disturbance on approximately 354 acres of summer security habitat. New NFS road construction designed to access units 36S and 47S would produce short-term disturbance on an additional 72 acres of summer secure habitat during implementation. Total area of summer security habitat affected by short-term disturbance is about 816 acres for alternative 2.

For alternative 3, no short-term disturbance would occur in summer security habitat as a result of new temporary roads or new NFS road construction. Total area of summer security habitat affected by short-term disturbance is about 462 acres for alternative 3.

The 12-month finding determined that effects to wolverines from land management actions such as grazing, timber harvest and prescribed fire are largely unknown. Wolverines in British Columbia used recently logged areas in the summer. They concluded that land management activities do not constitute a threat to the wolverine DPS.

Effects would be similar under both action alternatives. Direct or indirect effects to wolverine denning are not anticipated. Modeled denning habitat is found outside proposed treatment units. No winter logging is currently proposed.

Cumulative Effects

Because wolverines utilize large areas as home ranges, the cumulative effects analysis area consists of portions of the hunting unit 212 within the Boulder Creek, Lower Flint Creek, and Clark Fork River-Gold Creek 5th-level watersheds, as well as extending out 2 miles from, the BDNF administrative boundary. This area totals about 230 square miles, which is somewhat larger than average home ranges reported from studies conducted in Montana (Banci 1994), but includes portions of low-elevation areas that may not be used by the species. Of all the actions listed for the project portion of the analysis area in table 56, human use on roads and motorized trails (summer and winter) has the greatest potential to affect wolverine habitat use and movements. However, these activities are subject to access determined by seasonal road restrictions already taken into consideration for delineation of wildlife security areas. Therefore, no additional disturbance impacts would occur during summer and fall seasons. Snowmobiling activity may occur during the winter season, but no overlap with proposed activities is expected because no winter activities are proposed under this project. In addition, all modeled denning habitat in the project area is located within a winter nonmotorized area, thereby reducing risk of snowmobile disturbance to wolverine denning.

Potential impacts at the larger scale include human disturbance, trapping and climate change. No additional and overlapping disturbance effects related to roads and motorized trails on National Forest System lands are expected due to the same reasons described above for the project area. Trapping is managed by the State, and annual trapping harvest in Wolverine Management Unit (WMU) 2 is restricted to one wolverine (MFWP 2012a). Project activities would not reduce wolverine habitat and no increased trapping access would result; therefore, there would be no cumulative effects to wolverine trapping generated by project activities.

Climate change is important because of the wolverine’s close associations with persistent snow into May for denning. Modeled denning habitat in the cumulative effects analysis area is found around Rose Mountain, Pikes Peak, Goat Mountain, and other high-elevation peaks. Persistent spring snow has been identified as a critical component of denning habitat. Areas of persistent spring snow within northern and central portions of the Clark Fork-Flints landscape are shown in figure 34. While climate trends may impact denning, project activities are not expected to influence short- or long-term climate trends that may affect snow availability and persistence for the species.

Winter nonmotorized allocations prohibit motorized activity from December 2 to May 15. (See Forest Plan glossary). All modeled denning habitat within the project area coinciding with persistent snow (6 to 7 years of persistence) occurs within winter nonmotorized areas, thereby avoiding potential disturbance to denning by motorized use at the project scale. Outside the project area, some modeled wolverine denning habitats corresponding to persistent snow is located in areas where winter motorized use is not restricted. While motorized use in these areas may cause disturbance to denning, project-related activities would not impact denning.

Lands of other ownership within the cumulative effects analysis area include those under BLM, State of Montana, and private ownership. Past, present, and reasonably foreseeable activities on these lands include livestock grazing and/or timber harvest, mostly at lower elevations. On Montana DNR lands in the Douglas Creek area and on Montana State Prison lands, timber

harvest could affect secure areas on adjacent NFS land if additional roads are developed and accessible within 0.33 mile of BDNF lands. However, the potential for, and location of, future road developments on lands of other ownership is not identified. Because the distance of effect is 0.33 mile, the potential impacts to seasonal secure habitats at the project-level are minor.

Therefore, temporary disturbance effects from other activities on NFS lands and on lands of other ownership combined with effects generated by the action alternatives would cause minor short-term impacts to wolverines.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The FWS review of the regulatory mechanisms in place at the national and state level (USDI Fish and Wildlife Service 2010) note that the short-term, site-specific threats to wolverines from direct loss of habitat, disturbance by humans, and direct mortality from hunting and trapping are, for the most part, adequately addressed through state and federal regulatory mechanisms. They stated that federal ownership of much of the occupied wolverine habitat protects the species from direct losses of habitat and provides further protection from many other forms of disturbance. Wolverines can use habitats affected by moderate levels of human disturbance.

At the forest scale and landscape scale, winter nonmotorized areas provide secure winter habitats. This proposal would maintain secure areas and connectivity across the northern portion of the Flint Creek Mountain Range.

Summary of Effects

Potential denning habitat is unaffected by either action alternative. Activities associated with the project may cause short-term avoidance by an individual on summer habitats at elevations above 7,218 feet, but there would be no long-term changes in wildlife secure areas, connectivity areas, or areas of persistent spring snow or modeled denning habitat. Based on the above analysis, implementation of either action alternative may impact individuals or habitat but will not likely result in a trend toward federal listing or reduced viability of the population or species.

Townsend’s big-eared bat

Overall Population and Habitat Status and Distribution

Townsend’s big-eared bats range throughout the west, from southern British Columbia south along the Pacific Coast to central Mexico, east to the Great Plains. Elevations range from sea level to nearly 11,000 feet. General habitat associations include coniferous forest, mixed forest, deserts, prairies, riparian communities, active agricultural areas, and coastal habitat types (WBWG 2005). The species is known to occur throughout Montana, although the complete range extent within the State is unknown. Globally, the species is ranked as secure (G4), but is classified “at risk” (S2) in Montana due to rarity of occurrence and specialized habitat needs (USDA Forest Service 2009b).

Biological Information for Townsend’s big-eared bat

Roosting habitats in western Montana consist primarily of caves and mines, as well as rocky outcrops. Large-diameter trees may also be used for roosting in old-growth forests. Maternity roost sites include warmer areas of caves, mines, or buildings to a lesser extent. Hibernacula (winter roost sites) consist of caves with temperatures just above freezing with moderate levels

of relative humidity. Roost sites can occur within a variety of vegetation types (USDA Forest Service 2009b). Maternity colonies form between March and June (depending upon climate) and roost site fidelity from year to year can be high (WBWG 2005). Caves and abandoned mines that can be used as hibernacula in southwestern Montana are distributed across a broad range of elevations. The long-standing maternity colony (100+ years) at Lewis and Clark Caverns State Park, more than 50 miles east of the project area, has persisted for over a century.

Microclimate at winter roost sites typically ranged from at or near freezing to the mid-40s with relative humidity from 54-100 percent (Hendrix and Kampwerth 2001). Small moths comprise the bulk of this species' diet, although prey items include a variety of nocturnal flying insects. Foraging associations include edge habitats along streams as well as areas adjacent to and within a variety of wooded habitats (WBWG 2005).

Townsend's big-eared bat Habitat and Use of the Analysis Area

The project area contains no known caves, but does include known abandoned lode mine sites. These sites have not been reviewed for species presence or suitability for roosting. Several of these sites are located within units proposed for treatment. Potential foraging habitat consisting of a wide range of forest, riparian and nonforested vegetation types is distributed throughout the project area. Larger snags (greater than 15 inches d.b.h.) are present within the project area, estimated to occur at a rate of less than 2.9 per acre.

Environmental Consequences

Alternative 1 – No Action

For alternative 1, there would be no direct, indirect or cumulative effects to Townsend's big-eared bat or habitat from the Flint Foothills Vegetation Management Project because no project activities are proposed.

Direct and Indirect Effects

A total of seven abandoned lode mines are mapped as occurring in or within 100 feet of three commercial harvest units (22C, 23C, and 48C) and two prescribed burn units (3B and 4B). One additional mine of unknown type occurs at the perimeter of prescribed burn unit 5B. Field reconnaissance of the mine at Unit 23C shows that the structure is collapsed and would not support bat roosting use. Structure suitability and bat occurrence at the other mine sites is unknown. No impact to existing mine structure and vegetation near mine entrances would occur in commercial treatment units because known mine sites would be buffered 100 feet from timber harvest activities. In addition, within prescribed burning units, application of fire and burning would be avoided in known mining sites within prescribed burning units (Heritage project design features and mitigation measures, chapter 2). Because heavy smoke loads could impact roosting bats if they occur within proposed burn units, a project design feature has been incorporated that requires application of mitigation measures if the site appears capable of supporting Townsend's big-eared bat roosting (Wildlife project design features and mitigation measures, chapter 2).

To a lesser extent, Townsend's big-eared bat roosting may also occur in snags and large hollow trees. Direct effects to tree and snag-roosting bats by timber harvest activities would be avoided because all trees larger than 20 inches d.b.h. would be retained. Roost sites that consist of trees and snags less than 20 inches d.b.h. would be affected under both action alternatives, if they exist within proposed treatment units. The frequency of Townsend's big-eared bat use of green

trees and snags as roosting sites within the project area is unknown, but expected to be low since this species is more commonly associated with utilizing caves and abandoned mines as roost sites. Some disturbance to bats may occur due to noise during harvest activity, but the duration of disturbance would be short-term.

Cumulative Effects

Sensitive habitats for Townsend's big-eared bats consist primarily of local sites (i.e. caves and mines) while foraging can occur over a relatively broad area. Therefore, the project area encompasses the cumulative effects area for this species. Review of table 24 shows that no present or reasonably foreseeable activities are expected to impact this species. Roadside salvage and firewood cutting primarily affects dead lodgepole pine where tree diameters are likely to be less than 15 inches. Therefore, no cumulative impacts would result due to overlap between past, present, or reasonably foreseeable activities and activities proposed under alternatives 2 and 3.

Summary of Effects

No known Townsend's big-eared bat records, maternity colonies, or hibernacula occur within the project area. Several abandoned mines in addition to existing larger trees and snags may be capable of supporting seasonal roosting. However, project design features minimize the potential for adverse impacts to the species as a result of management activities. Therefore, implementation of either action alternative may impact individuals or habitat but will not likely result in a trend toward federal listing or reduced viability of the population or species.

Summary of Determinations for Federally Listed and R1 Sensitive Species

Table 58 contains a summary of effects determinations pertaining to threatened, endangered, and sensitive species.

Table 58. Northern Region sensitive species summary conclusion of effects for nonaquatic sensitive species occurring on the BDNF

Species	Scientific Name	Alternative 1 No Action	Alternatives 2 and 3
American peregrine falcon	*Falco peregrinus anatum*	NI	NI
Bald eagle	*Haliaeetus leucocephalus*	NI	NI
Black-backed woodpecker	*Picoides arcticus*	NI	MIIH
Greater sage-grouse	*Centrocircus urophasianus*	NI	NI
Flammulated owl	*Otus flammeolus*	MIIH	MIIH
Harlequin duck	*Histrionicus histrionicus*	NI	NI
Trumpeter swan	*Cygnus buccinator*	NI	NI
Bighorn sheep	*Ovis canadensis*	NI	MIIH
Fisher	*Martes pennati*	NI	MIIH
Gray wolf	*Canis lupus*	NI	MIIH
North American Wolverine	*Gulo gulo*	NI	MIIH
Northern bog lemming	*Synaptomys borealis*	NI	NI
Pygmy rabbit	*Brachylagus idahoensis*	NI	NI

Species	Scientific Name	Alternative 1 No Action	Alternatives 2 and 3
Spotted bat	*Euderma maculatum*	NI	NI
Townsend's big-eared bat	*Corynorhinus townsendii*	NI	MIIH

NE = No Effect

NI = No Impact

MIIH = May Impact Individuals or Habitat, but Will Not Likely Result in a Trend toward Federal Listing or Reduced Viability for the Population or Species

Terrestrial Management Indicator Species

Regulatory Framework

Management indicator species (MIS) are designated in the Forest Plan to represent species whose population changes are considered "indicators" for the effects of management activities on representative wildlife habitat.

Management Indicator Species

The BDNF Plan identified three terrestrial wildlife MIS shown in table 59.

Table 59. Terrestrial Management Indicator Species for the BDNF

Species	Habitat preference	Presence in analysis area
Elk	Habitat generalist. Winter range in lower elevation conifer/shrub/grassland mix. Security during hunting season is measured by open motorized road and trail densities over the hunting unit.	Yes
Wolverine	Higher elevations, rugged terrain, spring snowpack, the presence of conifer forests and edge associated with alpine habitat. Deep and persistent snow into May and areas free from human disturbance needed for reproductive dens. Summer and fall secure areas are measured by open motorized road and trail densities over the landscape.	Likely, based on modeled denning habitat and persistent snow and reports, as noted in the sensitive species section.
Mountain goat	High elevation, rugged, steep terrain. Suitable habitat is located in the extreme southern portion of the analysis area.	Yes, but species and habitats would be unaffected by proposed treatments under all alternatives.

Elk

Wisdom et al. (2004), cited in the Forest Plan FEIS (USDA Forest Service 2009b), has demonstrated threat responses of elk to motorized activity. Along with Christensen et al. (1993) references to habitat effectiveness and road density management suggest that elk are a useful MIS to monitor the effectiveness of motorized use management and secure habitat changes, especially since elk occur in every habitat type and virtually every elevation across the Forest.

The Flint Creek Range provides year-round habitat for elk. Hunting unit 212 comprises a portion of the Flint Creek Elk Management Unit, which includes the project area. At the time of the development of the State Elk Plan, the hunting unit exceeded elk population objectives (MFWP 2004). Population estimates have steadily increased since 2003. Elk numbers in

Hunting Unit 212 are currently about 2.7 times above management objective (MFWP 2012), as shown in table 60. Elk populations are widely distributed on the BDNF (appendix F).

Table 60. Elk herd objectives and population status estimates (MFWP 2012)

BDNF Hunting District	2004 FWP State Elk Plan Objective + 20%	FWP 2003 Population Estimates + 10%	FWP 2006 Population Estimates + 10%	FWP 2008 Population Estimates	FWP 2010 Population Estimates	FWP 2011 Population Estimates
212	1,000	1,100	1,074	1,825	2,504	2,693

The Forest Plan management tool for wildlife secure habitat, including elk is through management of open motorized road/trail densities (USDA 2009b).

The Forest Plan addresses wildlife secure areas through OMRTD as discussed previously (see table 44 through table 47) and much of the analysis will focus on maintenance or improvement of security during the summer season and fall hunting season. Rohrbacher (2011) provides more rationale for these measures to address elk and elk habitat (appendix F).

Summer Wildlife Security

As displayed in table 45, the Clark Fork-Flints Landscape currently meets summer OMRTDs identified in the Forest Plan. Figure 26 shows existing secure areas in the project area during the summer.

Fall Wildlife Security

Open, motorized, road and trail density is the metric by which fall secure elk habitat is managed (USDA Forest Service 2009, pp. 45-47). As shown in table 44, HU212 currently meets the Forest Plan goal. Wildlife Standard 1 in the Plan states “From October 15 to December 1 hunting units that exceed open motorized road and trail density objectives will have no net increase in designated open motorized road and trail mileage (over the hunting unit).” Figure 3 shows the current elk secure areas during the fall hunting season.

Hayes et al. (2002) and Unsworth et al. (1993) (in BDNF Elk Monitoring Report-Rohrbacher 2011, (appendix F) found that vegetation variables were not significant in relation to elk mortality from hunter harvest. Increases in open-road and hunter density were significant factors affecting elk mortality. Unsworth et al. states “Habitat is definitely important to the long-term viability of elk populations, but we believe that elk populations are more likely to be controlled by harvest than by limits in cover or forage. In most years, hunters, their efficiency modified by road density and topography, controlled elk populations.”

The importance of this discussion is that the Forest Plan emphasis on road density for secure areas for all wildlife provides for elk with an obvious metric that the Forest Service can manage—road density. This directly ties to Christensen et al. (1993) cited in the FEIS for the Forest Plan wherein they note “…where elk are one of the primary resource considerations, habitat effectiveness should be 50 percent or greater.” Tables 13 and 14 in the Forest Plan reflect this consideration.

Winter Range

Elk winter ranges are located at lower elevations that flank the northeast and northwest portions of the project area, including private and public (Forest Service, BLM and state) land. Figure 35 shows the location of winter range in and adjacent to the project area. There are no treatment units in elk winter range.

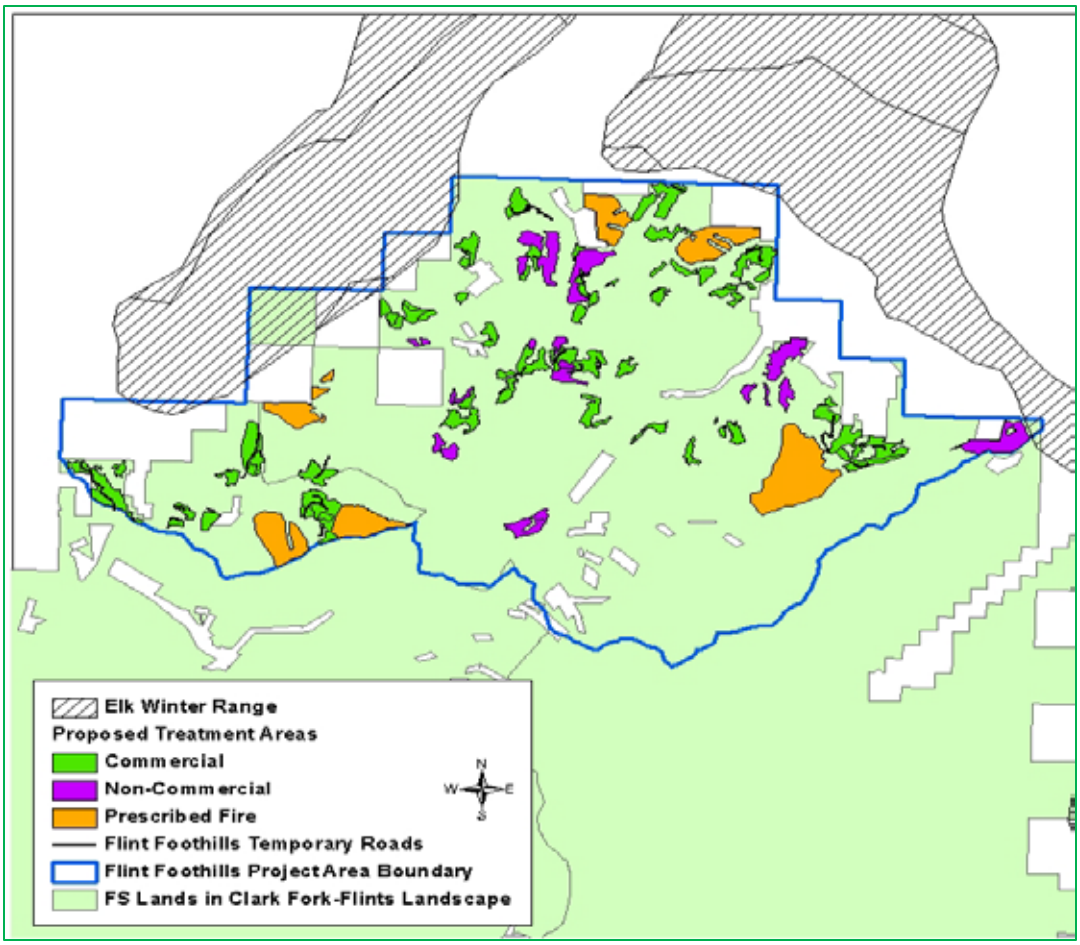


Figure 35. Elk winter range

Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

For alternative 1, there would be no direct, indirect or cumulative effects to elk or habitat from the Flint Foothills Vegetation Management Project because no project activities are proposed.

As displayed in table 44 and table 45, the Clark Fork-Flints Landscape and Hunting Unit (HU) 212 currently meet summer and fall OMRTD goals, respectively, identified in the Forest Plan. In addition, elk numbers in HU212 are currently 2.7 times higher than the management objective. The increases shown in table 60 have occurred in concert with the existing template

of multiple use activities, including road activity. As noted in table 48, despites short term implementation changes, long term secure areas would remain unchanged.

A review of the literature could find no correlation between elk densities and extensive stands with high levels of coarse woody debris (ERG 2010). Thus, it is assumed that changes in forest conditions when snags fall will (unsalvaged stands) not affect elk densities or distribution.

Wildlife standard 1 in the Forest Plan states “From October 15 to December 1 hunting units that exceed open motorized road and trail density objectives will have no net increase in designated open motorized road and trail mileage (over the hunting unit).” Figure 20 shows the current wildlife secure areas during the fall hunting season.

Alternatives 2 and 3

Direct and Indirect Effects

Effects could vary relative to timing of activities, along roads open during hunting season or in wildlife secure areas. This also includes disturbance effects due to increased traffic, human activity, and equipment use during project activities.

Effects to elk under both action alternatives are similar because existing travel restrictions would be followed under both alternatives.

Both action alternatives propose maintenance and reconstruction of existing roads, new and temporary road construction and temporary road reconstruction. Neither action alternative would result in a post-project increase in OMRTDs; open road densities would remain consistent with Forest Plan guidance. Alternative 2 reduces the amount of open road by 0.6 mile, but has no appreciable effect on road density at the landscape and hunting unit scales. Open road mileage under alternative 3 would remain identical to existing mileage post-project. All temporary roads would be decommissioned upon completion of project activities under both action alternatives. Newly constructed temporary roads would be decommissioned by obliteration, whereas existing temporary roads would be decommissioned primarily with signs and berms. Units and roads that are in fall secure areas are shown in figure 26 and table 44 and table 45. A project design feature has been added (Wildlife project design features and mitigation measures, chapter 2) to comply with existing travel restrictions and there would be no activities in fall secure areas during the hunting season when human disturbance activities are the greatest.

Winter Range

No treatments are proposed under any alternative in elk winter range; therefore, winter range habitat would not be affected. Several proposed timber haul routes cross through elk winter range. However, no units are proposed for winter logging. In addition, restricted road use due to spring breakup restrictions make it unlikely that timber haul would occur through winter range during the latter part of the winter period.

Spring (Calving Habitat)

Calving season generally runs from mid-May through mid-June. Specific areas used by elk for calving can change year to year. Typically, timber harvest and hauling activities do not occur during the calving season due to road use restrictions for spring breakup.

Summer Security
Open, motorized roads and trails are the greatest consideration on summer range relating to habitat effectiveness. As a result, the Forest Plan set secure area direction per landscape, as measured by OMRTDs. Secure areas are areas larger than 10 acres over 0.33 mile from an open route. Under the proposed action, all or portions of nine commercial units totaling 160 acres occur within summer secure areas. Alternative 3 would treat three units with a total of 58 acres in summer secure areas. OMRTDs would be maintained, below Forest Plan thresholds, as shown in table 45. During project implementation, existing travel restrictions would be followed with exceptions where roads are currently closed year-round. Roads closed year-round include roads 19752, 78472, and 78476 that access units 44S, 58S, and 69S under both action alternatives. Use of these roads for project implementation during the summer season would increase disturbance on 462 acres of existing summer security habitat under both action alternatives. All units accessed or located in fall secure areas would be restricted during that period under both action alternatives (Wildlife project design features and mitigation measures, chapter 2).

Under alternative 2, new temporary roads that would access units 48C, 55C, 56C, 57C, 68C, and 71C are located inside or within 0.33 mile of existing summer security habitat. Use of these roads in the summer season during implementation would produce short-term disturbance on approximately 354 acres of summer security habitat. New NFS road construction designed to access units 36S and 47S would produce short-term disturbance on an additional 72 acres of summer secure habitat during implementation. Total area of summer security habitat affected by short-term disturbance is about 816 acres for alternative 2.

For alternative 3, no short-term disturbance would occur in summer security habitat as a result of new temporary roads or new NFS road construction. Total area of summer security habitat affected by short-term disturbance is about 462 acres for alternative 3.

In addition, portions of three prescribed burn units (4B, 5B, and 6B) totaling 292 acres are in or partly in summer secure areas. None of these would require any temporary road or mechanized equipment and there would be no measureable effect on summer secure areas from these activities.

Fall Hunting Season Security
Wildlife standard 1 in the Forest Plan states “from October 15 to December 1 hunting units that exceed open motorized road and trail density objective will have no net increase in designated open motorized road and trail mileage (over the hunting unit).” OMRTDs in HU 212 are currently below Forest Plan thresholds. Construction of temporary roads would temporarily increase mileage but due to the low number of miles of road, there would be little measureable change over the hunting unit during project activities (table 45). These temporary roads would not be open to public use and would be decommissioned upon completion of harvest activities. There would be no net increase in road access and the Forest Plan standard is met.

Project design features include following existing travel restrictions; none of the units in fall secure areas would be harvested during the Oct 15- Dec 1 period under both action alternatives. In addition, precommercial thin units in some areas adjacent to main open roads during hunting season would maintain roadside cover. This would be effective until the lodgepole pine self-prune and lose their lower green branches.

Under alternative 2 there are 15 salvage and 3 seed tree units that are larger than 40 acres. Alternative 3 contains 14 salvage units and 3 seed tree units larger than 40 acres; of these, 11

occur in fall secure areas. As stated before, no activities would take place during the fall hunting season. Since these units are over 0.33 mile from an open route, vulnerability to hunter-related road use would not be expected to increase.

The actions proposed in both action alternatives incorporate timing restrictions for mechanized units in fall secure areas. These timing restrictions would eliminate disturbance in these areas during the season of concern, and measurable changes in elk distribution are not expected.

Cumulative Effects

The cumulative effects analysis area for elk consists of portions of HU 212 within and extending out 2 miles from the BDNF administrative boundary. Present and foreseeable actions within the project area (table 24) that might affect different seasonal habitats or secure areas (areas with minimal human disturbance) include: livestock grazing, Invasive plant species treatments, roadside hazard tree removal, and some recreational activities. Livestock grazing and invasive plant species treatments are important actions affecting winter range; however, the Montana State Elk Plan (MFWP 2004) has not identified any livestock grazing issues for winter range on HU 212. All Forest Service allotments are under a rest/rotation or deferred rotation grazing system. Each allotment management plan (AMP) contains riparian mitigation measures as well as riparian and upland use parameters (Range Resources section). On NFS lands, existing invasive plant species infestations are currently being treated with herbicides on an annual basis and will continue to be treated into the foreseeable future.

Lands of other ownerships within the cumulative effects analysis area include those under BLM, State of Montana, and private ownership. Past, present, and reasonably foreseeable activities on these lands include livestock grazing and timber harvest, mostly at lower elevations. Timber harvest could affect secure areas on adjacent NFS land if additional roads are developed and accessible within 0.33 mile of the Forest; however, the potential for, and location of, future road developments on other lands is not identified. The potential impacts to elk and secure habitats at the project level are minor because the distance of effect is 0.33 mile. Therefore, present and reasonably-foreseeable projects in combination with the action alternatives, would contribute minor cumulative impacts to elk.

Elk populations have been increasing in HU 212 within the context of existing multiple-use activities.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The Forest Plan includes direction to manage open motorized road and trail densities to provide wildlife secure areas. The Forest Plan standard states, "…from October 15 to December 1 Hunting Units that exceed the OMTRD objectives will have no net increase." This project does not result in a net increase (post-project) as shown in table 45, and meets the Plan standard.

Summary of Effects

Selection of either action alternative would not affect fall secure areas as measured by road densities at the project and forest scales. Incorporation of project design features would minimize potential impacts to elk distribution during the fall season. Increases in disturbance would occur on 816 acres of summer secure areas during project implementation under alternative 2, and 462 acres under alternative 3. However, the disturbance effects are expected to be short term. All action alternatives would retain post-treatment amounts of summer and fall security habitats equal to the existing condition. Elk populations on the BDNF would continue to be well distributed.

North American Wolverine

Wolverines were selected as a MIS to indicate changes in motorized winter recreation use levels because they use high, isolated areas for denning. Wolverines have been previously addressed as a sensitive species; see that section for the wolverine discussion for existing condition information.

Wolverines are difficult to detect due to low densities, small population size and remote habitats (Squires et al. 2006). Specific surveys were not done for wolverines in the project area. They are known to occur in the Flint Creek Range.

A denning habitat model was developed for the Forest Plan, based on Heinemeyer et al. 2001. This model incorporated slope, elevation, cover types and patch size. Forestwide modeled denning habitat correlates well (BDNF Habitat Query 2011) with Copeland et al. (2010) persistent snow.

At the forest scale, summer and winter nonmotorized areas were established across the Forest. Wolverines and modeled denning habitat were one of the criteria used to select winter nonmotorized areas. The southern end of the Flint Foothills project area contains a portion of one winter nonmotorized area. The Plan restricts winter motorized use on over 70 percent of the modeled wolverine denning habitat (USDA Forest Service 2009b). Monitoring of selected winter nonmotorized areas in 2009 found that winter nonmotorized use areas in the Flint Creek Range appears to be respected (USDA Forest Service 2009e).

Environmental Consequences

Alternative 1 - No Action

Direct, Indirect and Cumulative Effects

For alternative 1, there would be no direct, indirect or cumulative effects to wolverines or habitat from the Flint Foothills Vegetation Management Project because no project activities are proposed. Wolverines are not associated with specific vegetation types and no effects due to continued mortality in lodgepole pine, declines in aspen or increased Douglas-fir densities are predicted. Acres of secure areas would be maintained and current levels of habitat connectivity within the mountain range (and project area) would be maintained.

Alternatives 2 and 3

Direct and Indirect Effects

As discussed previously, there are records of wolverines in the area, but wolverines have large home ranges, are at low densities across the Forest and are hard to detect. Effects would be similar for both action alternatives. A denning habitat model was developed for the Forest Plan based on Heinemeyer et al. 2001. This model incorporated slope, elevation, cover types and patch size. Forest-wide there appears to be good correlation with Copeland et al. (2010) persistent snow.

At the forest scale, extensive summer and winter nonmotorized areas were established. Wolverines and modeled denning habitat were one of the criteria used to select winter nonmotorized areas across the forest. One area was selected in the northern portion of the Flint Creek Range, and this area is within the southern part of the project area (volume 2, appendix

F). The Plan restricts winter motorized use on over 70 percent of the modeled wolverine denning habitat on the Forest (USDA Forest Service 2009a).

The project area holds a relatively small quantity of modeled denning habitat that coincides with areas where there is persistent spring snow 6-7 years out of 7 (based on Copeland et al. 2010). Areas to the south in the central portion of the Flint Creek Range contain larger areas of persistent snow and modeled denning structure (figure 34).

Under the action alternatives, most proposed treatment units are located in areas where snow is present through the denning period 1 out of 7 years, and all commercial units are more than 1 mile from modeled denning habitat and areas where there is persistent snow 6 out of 7 years (where most dens occur according to Copeland et al. 2010) (table 56). In addition, 96 percent of the project area occurs below elevations normally used by wolverines during the winter and no treatments are proposed within these areas during the winter season. No effects to wolverine denning are expected. While there is overlap of summer use elevations and project activities, temporary avoidance due to activities in units in potential wolverine habitat outside the denning period may occur, but are not measurable, because wolverines have large home ranges and by nature are constantly on the move.

Cumulative Effects

Wolverines utilize large areas as home ranges; therefore, the cumulative effects analysis area consists of portions of the Boulder Creek, Lower Flint Creek, and Clark Fork River-Gold Creek 5th-level watersheds within and extending out 2 miles from, the BDNF administrative boundary. This area totals about 260 square miles, which is somewhat larger than average home ranges reported from studies conducted in Montana (Banci 1994). Of all the actions listed in table 54, human use on roads and trails (summer and winter) has the greatest potential to affect wolverine habitat use and movements. However, these activities are subject to access determined by seasonal road restrictions already taken into consideration for delineation of wildlife security areas. Therefore, no additional disturbance impacts would occur during summer and fall seasons. Snowmobiling activity may occur during the winter season, but no overlap with proposed activities is expected because no winter activities are proposed under this project. In addition, all modeled denning habitat in the project area is located within a winter nonmotorized area, thereby reducing risk of snowmobile disturbance to wolverine denning.

Potential impacts at the larger scale include human disturbance, trapping and climate change. Outside the project area, some modeled wolverine denning habitats corresponding to persistent snow are located in areas where winter motorized use is not restricted. While motorized use in these areas may cause disturbance to denning, project activities would not impact denning; therefore, there is no cumulative impact. No additional and overlapping disturbance effects related to roads and motorized trails on NFS lands are expected due to the same reasons described above for the project area. Trapping is managed by the state, and annual trapping harvest in Wolverine Management Unit (WMU) 2 is restricted to one wolverine (MFWP 2012a). Project activities would not reduce wolverine habitat and no increased trapping access would result; therefore, there would be no cumulative effects to wolverine trapping generated by project activities.

Climate change is important because of wolverine’s close association with persistent snow into May for denning. Modeled denning habitat in the cumulative effects analysis area is found around Rose Mountain, Pikes Peak, Goat Mountain, and other high-elevation peaks. Persistent

spring snow has been identified as a critical component of denning habitat. Areas of persistent spring snow within northern and central portions of the Clark Fork-Flints Landscape are shown in figure 34. While climate trends may impact denning, project activities are not expected to influence short- or long-term climate trends that may affect snow availability and persistence for the species.

On lands of other ownerships, timber harvest could affect secure areas on adjacent NFS land if additional roads are developed and accessible within 0.33 mile of BDNF lands. However, the potential for, and location of, future road developments on other lands is not identified. The potential impacts to seasonal secure habitats at the project-level are minor because the distance of effect is 0.33 mile. Therefore, past, present, and reasonably foreseeable projects on lands of other ownership would have an insignificant cumulative impact on availability of secure habitats.

Summary of Effects

Selection of either action alternative would not affect modeled denning habitat quantity or quality at the project and forest scale, and would maintain the existing amount of secure habitat to support the species. There is overlap of potential summer use areas and project activities, but the impacts are not measurable. Crucial denning habitat would remain unaffected by the project.

Mountain Goat

Mountain goats inhabit areas within the subalpine and arctic alpine zone of the northern Rocky Mountains and coastal ranges. The rugged terrain is comprised of cliffs, ledges, projecting pinnacles, and talus slopes. Goat range is associated with areas having well-defined glaciation at elevations between 4,500 and 10,000 feet. Grassy slide-rock slopes are major use areas in spring, summer, and fall. Alpine meadows are used most in mid-summer when vegetation on cliffs is sparse. Timbered areas are used during summer and fall by scattered single goats and by females in spring prior to parturition.

Mountain goats usually remain at or above the timberline and within reach of rocky outcrops utilized for retreat from danger. In general goats tend to make use of higher elevations during summer and lower ones in winter. They prefer to remain high on mountains and forage on windblown slopes, however, deep snows will force them to lower elevations. Water requirements for goats are generally satisfied by snow and melt water. The diets of mountain goats are quite broad and vary somewhat throughout their range; they utilize the most nutritious portions of grasses, sedges, rushes, forbs, shrubs, ferns, and mosses and lichens. During winter conifers can be a major portion of the goat diet.

Environmental Consequences

All Alternatives

General distribution of this species is shown to overlap the southern portion of the project area (MFWP 2008); however, no mountain goat occurrences are shown for the northern portion of the Flint Creek Range (Montana Heritage Tracker 2012; BDNF NRIS database). Mountain goat hunting in the northern Flint Creek Range has been closed since 2007 (MFWP 2012).

Suitable habitats are located in steep, rocky, alpine habitats outside proposed treatment units. Potential for mountain goat occurrence within treatment units is minimal. Proposed treatments

would not impact existing habitat or species distribution. Therefore, all alternatives would have no impact to population or habitat trend on the BDNF.

Other Species of Interest

A few additional species were addressed for this project because they were either detected during field surveys or were species of public interest; or are species with additional direction for analysis from a regional level (Canada lynx) or national level (migratory birds).

Northern Goshawk

The northern goshawk was removed from the Region 1 Sensitive Species list in 2007, based on a review of the best available science regarding the ecological status of the species, the estimated amounts and distribution of habitat in the Region, the results of the 2005 Inventory across the Region, and the completion of a Northern Goshawk Regional Overview 2007. The Regional Overview was revised in 2009, with new habitat estimates, a discussion of impacts of timber management and validity of activity timing restriction dates. This document is incorporated by reference. The overview found that based on recent broad-scale habitat and inventory and monitoring assessments conducted in Region 1, breeding goshawks and associated habitats appear widely distributed and relatively abundant on National Forest System lands (USDA Forest Service 2009d).

Authors of the Overview (2007 as amended) also looked at the effects of the current mountain pine beetle outbreak. They felt that the current outbreak and associated mortality poses uncertain risks to goshawk populations as a function of habitat change and loss. Data were lacking to comprehensively predict goshawk response to beetle outbreak, though some data does exist. Goshawk nest area on the Ashley National Forest in Utah experienced a mountain pine beetle outbreak of approximately 100,000 acres in lodgepole pine in the early 1980s. Goshawks continued to nest successfully in lodgepole pine forests where up to 80 percent of the overstory trees were killed (Graham et al. 1999, in Overview 2009). The number of young that fledged on these territories from 1989 until 1996 was comparable to numbers fledged over the same time period for many other populations in the western United States.

A more recent analysis that incorporates the effects of mountain pine beetle outbreak supports the contention that goshawk nesting habitat is well-distributed across the Forest. In 2010, Ecosystems Research Group (ERG) completed an evaluation of the Beaverhead-Deerlodge National Forest, using a simulation model (SIMPPLLE), to estimate how current changes from mountain pine beetle, other insect and disease, and wildfire might affect the habitats of selected wildlife species, including northern goshawk nesting habitat, for the next 50 years. The ERG analysis also examined how management treatments would affect disturbance processes and wildlife habitats. The ERG model suggests that stands providing northern goshawk potential nest habitat are currently represented on 9 percent of the Forest, or 18 percent of the forested area. SIMPPLLE modeled potential nest habitat remains at 18 percent of the forested landscape through 2020 and then increases to 20 percent by 2030 and 24 percent by 2060. In general, potential nest habitat is well distributed across the Forest in 2010, 2020, 2030 and 2060. The distribution does change from decade to decade. Northern goshawks nest in dense, multi-storied conditions, therefore, natural disturbances inevitably and periodically render any nest habitat unusable. Distribution of potential nest habitat does not appear to be a limiting factor to northern goshawk sustainability across the Forest.

In extensive landscapes of pure lodgepole pine, there may be a decline in currently suitable habitat. In the majority of the Forest, however, where lodgepole pine stands are interspersed with other cover types, the model suggests potential nesting habitat will not be limiting in future decades.

Because habitat is currently widespread and abundant, and the ERG evaluation suggests that goshawk nesting habitat will continue to be widespread and abundant over the next 50 years, despite the current MPB outbreak, this analysis focuses on the Forest Plan standard for protection of known active nest sites (this Plan standard also applies to great gray owls). Goshawks were added to the Forest Plan nesting standard as they have been identified as a species of interest through public comments, appeals or litigation (USDA Forest Service 2009a).

Goshawk surveys in 2010 and 2011 concentrated effort to determine status of historic nest sites. A total of nine historic sites were surveyed, none of which showed active nesting. Surveys were also conducted in units 27 and 43 with negative results. One new site with active nesting was discovered along Gird Creek in 2011 adjacent to units 56C, 57C, and 68C.

Environmental Consequences

Clough (2000) investigated habitat parameters associated with goshawks nesting in the northern portion of the Clark-Flints landscape area that includes the Flint Foothills project area. Results showed that, in general, goshawks nested in multi-storied stands with higher densities of large trees (greater than 15 inches d.b.h.) dominated by either Douglas-fir (57.9 percent) or lodgepole pine (42.1 percent). Only 3 of 19 occupied stands exhibited characteristics indicative of old-growth. Nests in lodgepole pine cover types were located at the lower extent of lodgepole pine distribution, whereas nests in Douglas-fir were found throughout the elevation range of this cover type. Nest sites were located primarily on northerly aspects (82.6 percent). Nest stand canopy closures ranged from 48-82 percent. Goshawk diets consist of a variety of bird and mammal species. As determined by total biomass, primary goshawk prey species in the northern Flint Creek Range described by Clough (2000) include snowshoe hare (53 percent), red squirrel (14 percent), Columbian ground squirrel (9 percent) and blue grouse (12 percent).

Analysis for northern goshawks has suggested that there is a 30,147-acre minimum viable population habitat threshold for the entirety of the Northern Region (Samson 2006). Updates to Samson (2006) by Bush and Lundberg (2008) indicate 363,593 acres of goshawk post-fledging habitat on the BDNF alone, greatly exceeding the Regional threshold.

Seasonal movements of goshawks within the project area are not well known. Samson (2006) describes goshawks in Region 1 as partial migrants. Squires and Ruggiero (1995) reported that goshawks in south central Wyoming migrated out of summer nesting habitats.

Alternative 1 - No Action

Direct, Indirect and Cumulative Effects

For alternative 1, there would be no direct, indirect or cumulative effects to northern goshawks or habitat from the Flint Foothills Vegetation Management Project because no project activities are proposed.

Alternatives 2 and 3

Direct and Indirect Effects

The action alternatives would result in changes to stand structure and species composition through salvage, thinning, seed tree harvest, and prescribed burning. This also includes disturbance effects due to increased traffic, human activity, and equipment use during project activities. Goshawk nesting use of lodgepole pine stands with high levels of mortality is uncertain (USDA Forest Service 2009d). Because goshawk nesting has been documented in such stands, this analysis assumes that existing older lodgepole pine stands (stands 10 inches or greater d.b.h.) proposed for salvage harvest may constitute suitable nesting at least in the short-term until needle-drop occurs thereby removing overstory canopy in the stand. Once needle-drop occurs, these stands may be used as foraging habitat by goshawks, but the extent of use is unknown.

Salvage by clearcut harvest, commercial thinning treatments and seed tree harvest have the potential to remove nesting habitat, as goshawks use denser stands for nesting. Vmap vegetation data shows that about 1,487 acres in the project area consist of stands 10 inches or greater d.b.h. with high canopy closure (60 percent or greater). Approximately 36 acres of harvest would occur in those stands, which equates to approximately 2.4 percent of suitable nesting habitat within the project area. Alternative 3 would treat slightly less, totaling 31 acres of suitable nesting habitat, or 2.1 percent of available habitat within the project area.

Post-treatment condition of thinned stands is projected to contain the larger trees at densities from 40-60 square feet of basal area with canopy closures ranging from 20-50 percent. Residual canopy closure within some thinned stands is expected to fall below 40 percent. Bush and Lundberg (2008) identified stands above 40 percent canopy closure as functional foraging habitat for goshawks. Therefore, commercial thinning treatments may remove foraging habitat in the short term until stand densities increase to suitable levels.

Effects to goshawk prey species would vary by species and treatment type. Snowshoe hares prefer stands with overhead cover and dense understories (Fisher and Wilkinson 2005, Litvaitis et al. 1985). Standard precommercial thinning prescriptions have the potential to reduce snowshoe abundance and habitat by reducing overhead density (Griffin and Mills 2007, Hoymack et al. 2007). Precommercial thinning units proposed for treatments under this project consist of older stands not currently expected to provide snowshoe hare habitat (see Snowshoe Hare analysis that follows). Proposed salvage treatment units currently lack dense understories. In addition, overhead canopy density is lacking due to recent MPB mortality. Therefore, stands proposed for salvage harvest generally lack snowshoe hare habitat characteristics. Douglas-fir stands proposed for commercial thinning in this project generally contain dense overstories, and consequently, contain sparse shrub and tree understories that provide little habitat for snowshoe hares.

Red squirrels comprise another main diet component for goshawks. Stone (1995) found that red squirrels were abundant in lodgepole pine stands with low (26-50 percent) mortality during a mountain pine beetle epidemic, but squirrel abundance decreased in stands with higher tree mortality due mainly to reductions in canopy foliage. High tree mortality also reduces availability of conifer cones as a food source. Lodgepole pine salvage harvest under this project may decrease red squirrel abundance within treatment units, but the degree of impact is reduced by the advanced level of existing tree mortality in stands proposed for treatment.

Treatments in Douglas-fir stands have the potential to impact red squirrel densities. In dry Douglas-fir stands, Herbers and Klenner (2007) reported that partial timber harvest reduced red squirrel abundance by approximately 40 percent from 2-4 years after 50 percent of timber volume was removed. Thinning treatments in Douglas-fir stands are proposed on 1,149 acres under alternative 2, thereby potentially affecting red squirrel abundance on 10 percent of existing Douglas-fir 10 inches or greater d.b.h. on BDNF within the project area. Alternative 3 proposes commercial thinning on 666 acres, which equates to about 6 percent of existing Douglas-fir 10 inches or greater d.b.h. Untreated Douglas-fir stands would continue to support red squirrel at existing levels within 90 percent and 94 percent of existing habitat under alternatives 2 and 3, respectively.

Low-intensity underburning in lower-elevation stands may reduce stand understory density, but is expected to maintain overall nesting suitability where it occurs within treatment units. Prescribed burning at mid-elevations in lodgepole pine has the potential to reduce available nesting habitat on an estimated 504 acres under both action alternatives. However, these stands consist predominately of lodgepole pine where abundant tree mortality is expected to exist, therefore, the current suitability of these stands for goshawk nesting is unknown.

At a larger scale, ERG (2010) modeled suitable goshawk amounts for a 50-year period comparing treatment and no-treatment scenarios within the Clark Fork-Flints landscape. Habitat under both scenarios is expected to remain fairly stable through 2020, with slight increases shown in 2030 (table 61). In 50 years, slight decreases are projected under both scenarios. Modeling results indicate that suitable goshawk habitats would be available through time at the landscape scale regardless of treatment or no treatment.

Table 61. Modeled acres of potential goshawk nest habitat from 2010 to 2060

Clark Fork-Flints	2010	2020	2030	2060
No Treatment	185,345	185,423	188,041	174,001
Treatment	185,345	187,479	199,048	189,705

(source: ERG 2010)

Goshawks were removed from the Northern Region Sensitive Species list in 2007. Direction from the Regional Office states "…although the goshawk is no longer a sensitive species, analysis of goshawks and their habitat should continue on Forests that use them as MIS" (letter dated 17 July, 2007). The goshawk is not a MIS on the BDNF. Because of this, most of the analysis for goshawks is based on Forest Plan direction. Forest Plan vegetation management direction is designed to restore, maintain and retain a range of landscape conditions under which species evolved. The Forest Plan includes a standard to mitigate management actions around known active nest sites of TES birds, including goshawks.

The 2009 Northern Region Northern Goshawk Overview reviewed timing restrictions. Clough found a random sampling of breeding goshawks (on the BDNF) began incubating eggs on May 5 (+/- 1 day) and fledged by July 12 (+/- 1 day) (USDA Forest Service 2009c). The prohibited operating period used for this project is April 15 to August 15 and is more than adequate to protect active nest sites. This project includes a 40-acre nest buffer. Studies have found a range of nest area sizes (30 acres by Reynolds in the southwest, 1-32 acres by Squires and Reynolds (1996) in Wyoming, and 40 acres reported by Clough in west central Montana on the BDNF (as

discussed in the Overview) and this project used nest area size reported from this part of the goshawks range.

There is a known goshawk nest site in proximity to proposed treatment units 56C, 57C and 68C. A mitigation measure (Wildlife project design features and mitigation measures, chapter 2) has been added to do pre-implementation surveys in areas with potential goshawk sightings and nests if specific units are harvested during the breeding season. Because the Forest Plan standard addresses reducing disturbance during the nesting period, nest stands could be harvested outside the nesting season. But, because habitat is widespread and abundant within the Forest and landscape, there would be minimal effect on goshawks or goshawk habitat at these scales.

Cumulative Effects

The cumulative effects analysis area for goshawks is the project area. Past wildfire suppression has led to denser Douglas-fir stands that may have increased available goshawk nesting habitat. Review of ongoing and foreseeable activities in table 24 shows no ongoing or foreseeable projects that are expected to affect mature Douglas-fir, ponderosa pine stands or live mature lodgepole pine stands. Roadside salvage and most firewood cutting occur in dead lodgepole pine. In addition, other actions that could affect raptor nest sites are subject to the Forest Plan standard to mitigate around known active nests. Continued wildfire suppression activities at lower elevations where most Douglas-fir/ponderosa pine stands are located would favor retention of denser stand conditions for nesting. No measurable cumulative effects to goshawks are expected.

Great Gray Owls

Great gray owls were also added to the Forest plan bird nesting standard. They have been identified as a species of interest through public comments, appeals or litigation (USDA Forest Service 2009a). Great gray owl populations are secure globally, which means that they are considered “common, widespread and abundant”. In Montana, they are ranked S3 which means they are vulnerable due to a restricted range, relatively few populations, recent and widespread declines, or other factors making them vulnerable. They are considered a Species of Concern by the state of Montana. No statewide population estimates are available for Montana and no long-term, rigorous or standardized data on regional or local breeding populations are available (USDA Forest Service 2009b). The great gray owl appears to be widely distributed and relatively well represented on NFS lands in the western half of Montana based on broad-scale data in MNHP Tracker (MNHP 2011) database.

The Biological Evaluation for the Forest Plan found that direction to increase vegetation resiliency, maintain old growth, and retain large snags in managed units similar to those found in unmanaged areas, along with timber harvest (largely in beetle-killed lodgepole pine stands that do not provide good quality habitat) would not cause a loss of viability of the great gray owl or cause a trend toward federal listing (USDA Forest Service 2009b).

Great gray owls nest early, beginning nesting in March or April. Nests are placed on large, broken-topped snags, old stick nests of other birds or in debris platforms from dwarf mistletoe. They prefer mature, dense (greater than 60 percent canopy closure) forest near natural meadows or open forest for hunting. Preferred foraging habitat in northeastern Oregon consists of forested stands with canopy closures ranging from 11-59 percent (Bull and Henjum 1990), while others reported preference for nonforested openings (Duncan and Hayward 1994). The species is known to use spruce-fir, lodgepole pine and Douglas-fir cover types on the BDNF.

Approximately 50 percent of these cover types on the Forest are in the large size classes that would provide nesting habitat for the owl (USDA Forest Service 2009b).

Environmental Consequences

Alternative I - No Action

Direct, Indirect, and Cumulative Effects

For alternative 1, there would be no direct, indirect or cumulative effects to great gray owl or habitat from the Flint Foothills Vegetation Management Project because no project activities are proposed.

Alternatives 2 and 3

Units were prioritized for surveys based on proximity to meadows or parks. Great gray owl surveys were conducted in 2011 in units 1ST, 5ST, 20C, 24C, and 59C with no positive response. In late August and early September, 2011 (after the nesting season) great gray owls were observed in units 10S and 49S. One great gray owl was heard from unit 25C during flammulated owl surveys.

A mitigation measure has been added to do pre-implementation surveys in these units if they would be harvested during the breeding season (March 15 – July 15). If the pre-implementation surveys are not conducted, a limited operating period prohibiting logging operations would be required and no harvest activities would occur during the breeding season. No surveys would be required if logging operations occur outside of the breeding season.

Great gray owl timing and nest buffers were established based on the best available information, largely from other parts of their range (appendix F). The 30-acre nest buffer includes the area where nestlings are found immediately after fledging while they are flightless and vulnerable. The limited operating period begins in mid-march which is consistent with the majority of studies; and the mid-July date accommodates the period post-fledging when owlets are still found in the vicinity of the nest.

Some units are larger than 40 acres, but would not affect suitability of the larger area for use by these raptor species as they are highly mobile and cross openings.

The Biological Evaluation for the Forest Plan found that Plan direction to increase vegetation resiliency, maintain old growth, and to retain large snags in managed units similar to those found in unmanaged areas along with timber harvest (largely in beetle-killed stands that typically do not have enough large diameter snags to provide good quality habitat) would not cause a loss of viability of the great gray owl or cause a trend toward federal listing (USDA Forest Service 2009b). Plan direction has been incorporated into this project. While the nest standard would protect know nests during the breeding season, nest stands could be treated outside of the breeding season.

Both action alternatives would result in changes to stand structure and species composition through commercial thinning, seed tree harvest and prescribed burning. Salvage treatments are not expected to affect available nesting habitat because this species is not known to utilize stands of dead lodgepole pine for nesting. Effects to the species also include disturbance due to increased traffic, human activity, and equipment use during project activities.

Because great gray owls use denser stands for nesting, commercial thinning treatments and seed tree harvest have the potential to remove nesting habitat. A review of Vmap vegetation data for the project area shows a total of 501acres in non-lodgepole pine stands contain canopy closures greater than 60 percent and trees 10 inches or greater d.b.h. Of these, a total of 32 acres (6.4 percent) occur within commercial thinning and seed tree harvest units. While some great gray owl use may be occurring in available green lodgepole pine stands, this analysis does not include lodgepole pine due to unknown levels of tree mortality and existing canopy closures in stands outside those identified for salvage treatment. Alternative 3 would treat fewer acres, resulting in impacts to 28 acres, or about 5.6 percent of larger-diameter Douglas-fir and spruce/fir stands.

Post-treatment condition of thinned stands is projected to contain the larger trees at densities from 40-60 square feet of basal area with canopy closures ranging from 20-50 percent, which approximates a portion of the range of suitable canopy closure for foraging described by Bull and Henjum (1990).

Prescribed burning at mid elevations has the potential to reduce available nesting habitat on approximately 15 acres (3 percent) in suitable habitat outside lodgepole pine stands under both action alternatives. However, these stands consist predominately of lodgepole pine where abundant tree mortality is expected to exist.

Cumulative Effects

The cumulative effects analysis area for great gray owls is the project area. Past wildfire suppression has led to denser Douglas-fir stands that may have increased available goshawk nesting habitat. Review of ongoing and foreseeable activities in table 24 shows no ongoing or foreseeable projects that are expected to affect mature Douglas-fir, ponderosa pine stands or live mature lodgepole pine stands. Roadside salvage and most firewood cutting occur in dead lodgepole pine. In addition, other actions that could affect raptor nest sites are subject to the Forest Plan standard to mitigate around known active nests. Continued wildfire suppression activities at lower elevations where most Douglas-fir/ponderosa pine stands are located would favor retention of denser stand conditions for nesting, but decrease the occurrence of open-structured conifer and forest openings that serve as foraging habitat. No measurable cumulative effects to great gray owls are expected.

Canada Lynx

The Northern Rockies Lynx Management Direction Record of Decision (USDA Forest Service 2007) classifies the Beaverhead-Deerlodge National Forest as unoccupied by Canada lynx (USDA Forest Service 2009b).

Prior to the decision declaring the Forest to be unoccupied, lynx surveys were done across the Region. In the late 1990s a noninvasive hair snag pad DNA survey was conducted on grids across the Region. Lynx detection surveys were conducted on the BDNF from 1999-2001; no lynx were detected. Sample identification results from lynx detection surveys are shown in table 62. Figure 36 and figure 37show locations of lynx survey points on the BDNF, some of which occur in the Clark Fork-Flints Landscape.

Table 62. National Lynx Survey BDNF, Summary DNA results, 1999- 2001

Species	1999	2000	2001
Coyote	5	3	2
Black bear	8	2	24
Bobcat	7	0	4
Wolf/dog	1	1	0
Cougar	0	2	0
Domestic cat	0	0	1
Ungulate	0	0	3
Other*	12	0	2

*Other species is defined as a species that was not a cat (domestic or wild), bear, canid, or ungulate.

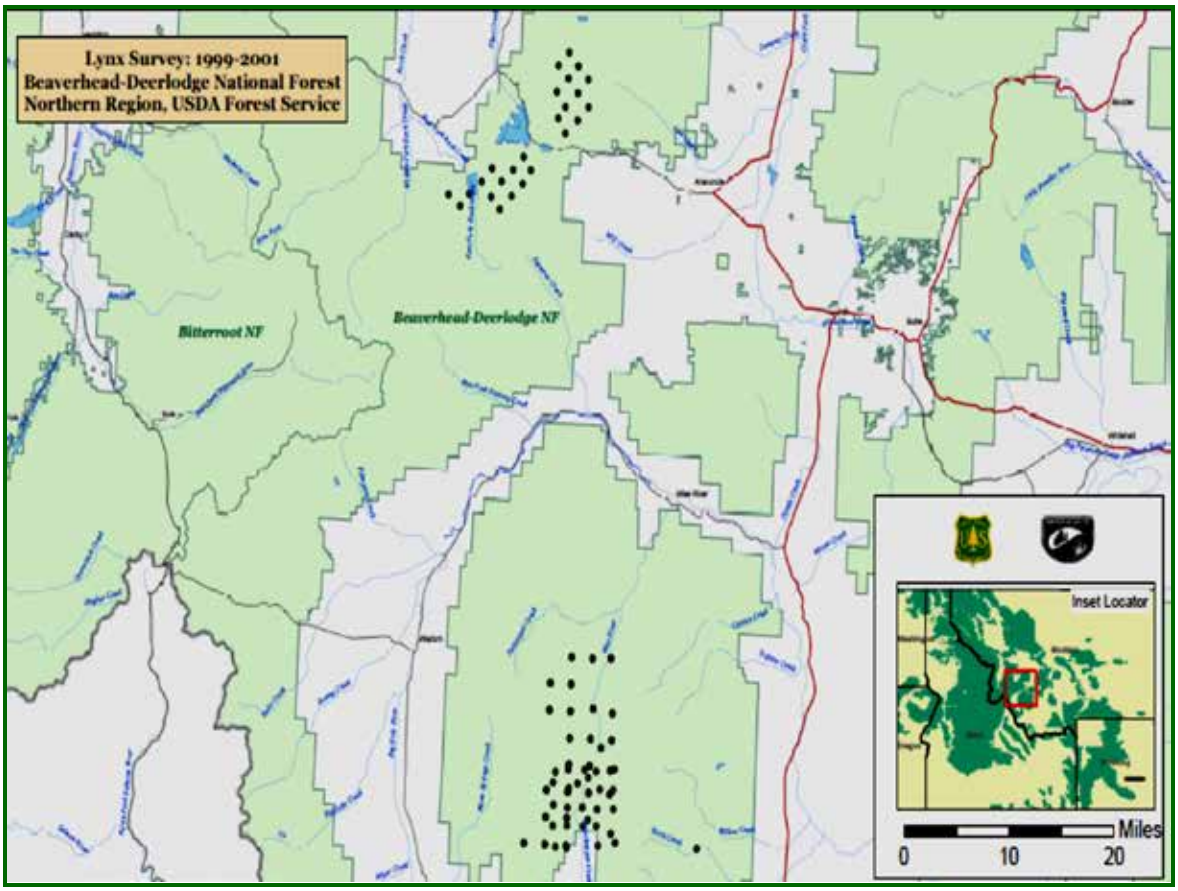


Figure 36. Vicinity Map, 1999-2001 BDNF Lynx Survey Locations

Squires et al. (2003) began what was to be a lynx survey in the Pioneer, Anaconda-Pintler and Flint Creek mountain ranges in 2001 (to the south, west, and north of the project area). Rigorous winter snow track surveys were conducted as a first step to determine the presence and distribution of lynx. They only found a single lynx track throughout the three mountain ranges. Although data show that lynx were historically present in the area, the area did not support a resident population at the time of their survey. Because lynx were at such low densities, and they detected numerous wolverines, that study shifted to wolverines.

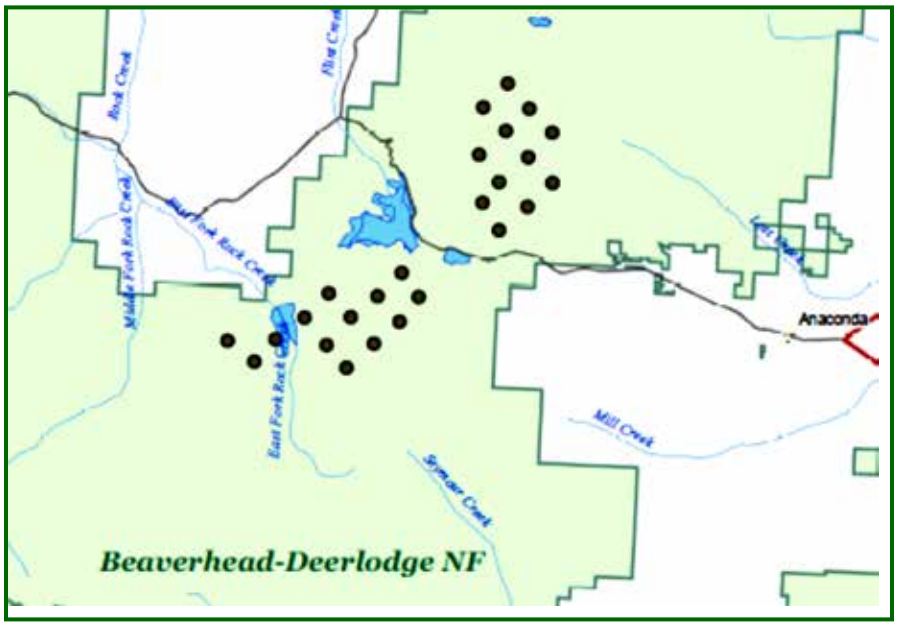


Figure 37. Lynx Survey Locations

Subsequently, in the spring of 2009, two different groups did lynx surveys on the Forest. Nate Berg (Greater Yellowstone Lynx Study) identified and surveyed a few areas of lynx habitat using track surveys. Two routes were run in the Flint Creek mountain range, two routes in the Sapphire/Anaconda-Pintler, one route in the Boulder Mountains, two routes in the Pioneers and one route on the Mt Haggin WMA (Berg 2009). One possible set of lynx tracks were found on the West Fork Rock Creek (Sapphire Mountains), but poor snow conditions precluded positive identification. Another group, Wild Things Unlimited, conducted hair snare and remote camera system surveys in the Flint Creek, Pioneer and Boulder mountains in 2009 (Porco 2009). None of the surveys resulted in confirmation of lynx presence.

In 2000, lynx habitat was mapped across the Forest, based on Regionwide protocol. This mapping included dry site Douglas-fir and lodgepole pine that has lower suitability for lynx. Based on that mapping, the project area includes Lynx Analysis Unit (LAU) numbers 18, 28, 30, and 36 and very small portions of 55 as shown in figure 38.

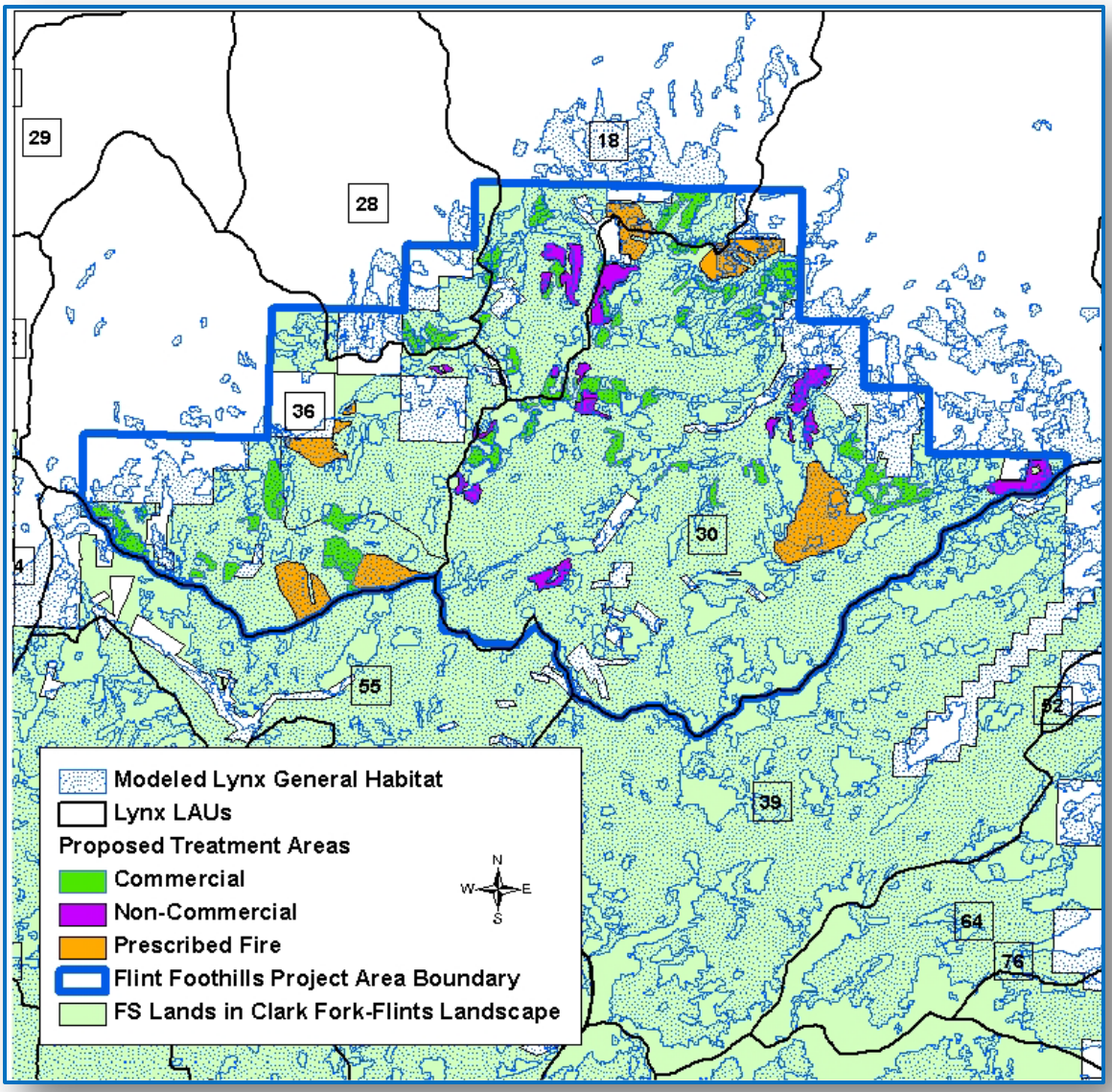


Figure 38. LAUs and mapped lynx habitat

ERG (2010) found that currently only 0.1 percent of the forested landscape on the BDNF provides multi-storied potential habitat for lynx (spruce-fir-lodgepole pine stands greater than5 inches d.b.h./two-storied or multi-storied stands. This is due to (1) eastside lodgepole pine (BDNFs predominant cover type) seldom having multi-storied stands; and (2) mesic spruce/fir stands are a minor type on the BDNF.

Devineau et al. (2010) published a paper with a map showing lynx satellite locations following reintroductions of lynx in Colorado. While the map does show numerous locations in Montana, including southwest Montana, interpreting Devineau et al. (2010) as supporting lynx occupancy of the Beaverhead-Deerlodge NF is incorrect. The Devineau et al. locations, as substantiated by Jake Ivan-Colorado Division of Wildlife, are clearly transient animals that did not stay in Montana. According to Ivan (2011), “Eight of 218 reintroduced lynx in Colorado made 10

forays into Montana lasting between 1 and 217 days (no Colorado-born kittens went to Montana). One individual localized for about 2 weeks in the Madison Range, but other than that these animals were most definitely traveling." The Madison Range is approximately 75 miles southeast of the Flint Foothills project. None of the locations were in the project area and cannot be construed as establishing occupancy for the BDNF. The definition from the USDA/USDI Amendment (2006) defines occupancy as:

1. There are at least 2 verified lynx observations or records since 1999 on the national forest unless they are verified to be transient individuals; or
2. There is evidence of lynx reproduction on the national forest.

The 2009 Forest Plan, Appendix G, pg. 29 (Record of Decision – Northern Rockies Lynx Management Direction) notes: "… as noted in the Biological Opinion, the FWS said, and we agree that lynx detection is needed to assess whether further management direction is warranted. Therefore, we agree to work with the FWS to develop and complete an acceptable protocol to survey currently unoccupied lynx habitat in secondary areas as described in the Biological Opinion, Terms and Conditions #4."

The Forest is establishing lynx-hair snare survey points on the Forest in 2012, as per terms and conditions in the Biological Opinion and ROD for the Lynx Amendment. At this time, the points are being established per hair snare protocols developed by McDaniel et al. (2000). Results will be documented in subsequent monitoring reports.

Direction on occupied and unoccupied lynx habitat was provided in a letter from the Regional Forester in 2009 (USDA Forest Service 2009c). This letter directs unoccupied forests to "…consider lynx management direction using the Northern Rockies Lynx Management Direction Standards and Guidelines Consistency Evaluation Table for Project Specific Activities." This has been done and is found in appendix F. There are four vegetation standards that apply directly to this project (Veg S1, Veg S2, Veg S5 and VegS6) and they are discussed in the lynx and snowshoe hare analyses that follow.

Environmental Consequences

Alternative 1 – No Action

Direct, Indirect, and Cumulative Effects

For alternative 1, there would be no direct, indirect or cumulative effects to Canada lynx habitat from the Flint Foothills Vegetation Management Project because no project activities are proposed.

Alternatives 2 and 3

Direct and Indirect Effects

This proposal would result in changes to stand structure and species composition through salvage, thinning, seed tree harvest, and precommercial thinning. This also includes disturbance effects due to increased traffic, human activity, and equipment use during project implementation.

Subalpine fir and spruce provide the most suitable structure and composition to provide habitat for lynx. This proposal would salvage dead and dying lodgepole pine and would not affect the

most suitable habitat. Dead and dying lodgepole pine on dry sites do not provide cover for primary prey species, and do not intercept snow or moderate weather. The units currently have little downed wood for cover. As a result, there would be no change in the amount of available habitat for lynx, should the BDNF become occupied in the future. Snags and downed wood would be retained in the salvage units at levels prescribed under the Forest Plan. This would maintain these habitat components in the units in the future. See appendix F for complete Lynx Evaluation Table.

Veg S1

Veg S1 states "… unless a broad-scale assessment has been completed, if more than 30 percent of the lynx habitat is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation projects. Table 63 shows that this standard is being met (no LAUs are above 14 percent).

Table 63. Habitat and past regeneration treatments within lynx analysis units

LAU Number	Total NFS Acres	Acres Lynx Habitat	Percent Habitat	Acres Past Regeneration Activities*	Past Stand Initiation Percent of Total Acres (VEG S1)
18	3,868	2,930	76	142	5
28	1,001	638	64	54	8
30	23,698	18,491	78	2,652	14
36	8,400	6,782	81	838	12

Veg S2

Standard VEG S2 applies to all vegetation management[48] projects that regenerate timber, except for fuel treatment projects within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitation:

- Fuel treatment projects within the WUI[49] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).
- For fuel treatment projects within the WUI[49] see guideline VEG G10.
- Veg S2 states, "Timber management projects shall not regenerate more than 15 percent of lynx habitat on NFS lands in an LAU in a ten-year period".

Table 64 shows that this standard is met by alternative 2: none of the LAUs are over 9 percent. Alternative 3, which has less acres of salvage and precommercial thinning would also meet Veg S2.

Veg S5 and Veg S6

A discussion of Veg S5 and Veg S6 for snowshoe hare follows in the next section.

Table 64. Acres of lynx habitat affected – Alternative 2

LAU Number	Acres of Lynx Habitat (NFS Lands)	Acres of Lynx Habitat Proposed Salvage	Acres Seed Tree Harvest	Acres Regen Last 10 Years*	Percent of Habitat VEG S2	Acres Commercial Thin DF	Acres Prescribed Burn	Acres PCT
18	2,930	90	150	5	8%	232	139	209
28	638	0	57	0	9%	86	0	0
30	18491	925	147	477	8%	240	710	813
36	6782	184	0	226	6%	590	749	26

*includes ongoing roadside salvage project

Snowshoe Hare

Veg S5

The snowshoe hare occurs in overstocked stands of lodgepole pine (and other stands with dense vegetative cover) and is an important prey species for many predators, including the Canada lynx. Winter was determined to be a critical time for lynx, and as a result the Northern Rockies Lynx Management Direction includes a standard for precommercial thinning limits to maintain snowshoe hare habitat (Veg S5). The standard reads: "…precommercial thinning projects that reduce snowshoe hare habitat, may occur from the stand initiation stage (harvest) until the stands no longer provide winter snowshoe hare habitat only within…" and then lists exceptions.

Occurrence and distribution of snowshoe hares was not determined in the field, rather the focus was on suitability of stands proposed for precommercial thinning for winter snowshoe hare habitat. Hamann (USDA Forest Service 2011) described methodology and results for assessing suitability of stands proposed for precommercial thinning for winter snowshoe hare habitat in the Fleecer Mountains. To determine whether stands proposed for precommercial thinning still provided winter snowshoe hare habitat, a representative sample of units where harvest varied were sampled in March and September 2010. Data collected in the Fleecer Mountains during the winter included snow depth and distance from snow surface to lowest green branches of overstory trees. This data was gathered in transects within the units, and then also in mature forest outside but adjacent to units. Summer surveys were walk-through surveys to get general information on stand conditions. Results from the Fleecer Project area showed that conifer regeneration in timber stands harvested in the 1980s and 1990s currently provided suitable conditions for snowshoe hare foraging due to lack of self-pruning and green branches accessible given the measured snow depths (table 65). Conifer regeneration in stands harvested prior to the 1980s had self-pruned and green branches (snowshoe hare forage) out of reach and well above snow depth.

Table 65. Results of precommercial thinning review, Fleecer Mountains (USDA Forest Service 2011)

Year of original harvest	Current stand condition
1960s	Average stand height is 30 ft. and average height to lowest green branches ranged from 2 ft. to 12 ft. Fairly high mortality (80% in trees >6" d.b.h., 30% in trees <6" d.b.h.) was noted. The majority of trees in these units have self-pruned and there are few to no green branches that would be available for snowshoe hare in winter.
1970s	Average trees are 4" d.b.h. and 20-22 ft. in height. Trees adjacent to openings have not self-pruned and have green branches that would be available. However, where stand densities are higher (where thinning would occur), they have self-pruned and lowest green branches are approximately 10 ft. up. This is well above snow depth and would not provide winter snowshoe hare habitat.
1980s	Average trees are 2" d.b.h. and 8 -10 ft. in height, with low mortality. Green branches are present at snow surface. Surveys in summer again found that trees had not self-pruned and would be suitable for snowshoe hare winter habitat.
1990s	Suitable winter snowshoe hare habitat.

Based on FS field surveys March and September 2010

For the Flint Foothills Project, proposed precommercial thinning units were reviewed for year of stand initiation. Consistent with methods described for the Fleecer Mountains Project (USDA Forest Service 2011), proposed units where stand growth was initiated after 1979 are expected to be providing suitable snowshoe hare habitat, and were removed from treatment consideration. Advanced growth and self-pruning of lower branches in stands initiated prior to 1980 precludes use by snowshoe hare. However, field reviews conducted in 2012 showed that two proposed units, 36P and 39P that originated from treatment in 1978, contain suitable snowshoe hare habitat.

Veg S6

Veg S6 states, "Vegetation management projects that reduce snowshoe hare habitat in multi-story mature or late-successional forests may occur only:

1. Within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special use permit improvements, including infrastructure within permitted ski area boundaries; or
2. For research studies or genetic tree tests evaluating genetically improved reforestation stock; or
3. For incidental removal during salvage harvest (e.g. removal due to location of skid trails).

Preliminary review of conditions within proposed treatment units suggested that multi-storied structure providing suitable snowshoe hare habitat exists in four units 27ST, 30ST, 32ST, and 33C proposed for commercial treatment as well as Unit 5B, proposed for prescribed burning.

Environmental Consequences

Alternative 1 – No Action

Direct, Indirect, and Cumulative Effects

For alternative 1, there would be no direct, indirect or cumulative effects to snowshoe hare habitat from the Flint Foothills Vegetation Management Project because no project activities are proposed.

Alternatives 2 and 3

Direct and Indirect Effects

Veg S5

Units from the 1980s and 1990s are still providing winter snowshoe hare habitat. Precommercial thinning in these units was dropped from consideration during the initial planning phase of the project. Field reviews conducted in 2012 showed that two proposed units, 36P and 39P, contained suitable snowshoe hare habitat. Therefore, precommercial thinning in units 36P and 39P would remove suitable snowshoe hare habitat. All other precommercial thin units in the action alternatives would meet Veg S5.

Because portions of some units may contain some winter snowshoe hare habitat due to differential tree spacing and density within a given stand, a project design feature has been added to retain full-crowned trees (ones with green branches down to within one foot of the ground) during thinning. This would retain those trees that are providing winter cover and forage for snowshoe hares.

VegS6

Preliminary review of conditions within proposed treatment units suggested that multi-storied structure providing suitable snowshoe hare habitat exists in four units, 27ST, 30ST, 32ST and 33C, proposed for commercial treatment, and also Unit 5B, proposed for prescribed burning. Additional field review in Unit 5B will be required to verify suitability for snowshoe hares. Burn treatments are projected to result in more open stand densities with reductions in understory tree density, thereby removing snowshoe hare habitat if verified as present within Unit 5B.

Summary of Cumulative Effects for Lynx and Snowshoe Hare Habitat

The Northern Rockies Lynx Management Direction Standards and Guidelines Consistency Evaluation Table for Project-Specific Activities provide a means of measuring potential impacts to lynx habitat, including past, present, and ongoing effects in conjunction with activities proposed under this project. Habitat availability and habitat treated indices are within thresholds identified in the Lynx Management Direction for VegS1 and VegS2; therefore, cumulative effects generated by this project in combination with other activities are expected to be minor. Foreseeable projects with the potential to impact lynx habitat would be subject to the lynx management direction standards, and therefore are not expected to contribute cumulative impacts to lynx habitats at the LAU scale.

Migratory Birds

A Memorandum of Understanding (MOU) between the USFS and USFWS was signed in December 2008 (USDA Forest Service and USDI Fish and Wildlife Service 2008). This MOU

meets the requirements of Executive Order 131866, and outlines a collaborative approach to promote the conservation and reduce the take of migratory birds. The purpose of the MOU is to strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and avoid or minimize adverse impacts on migratory birds. Within the National Forests, conservation of migratory birds focuses on providing a diversity of habitat conditions at multiple scales and ensuring that bird conservation is addressed when planning for land management activities.

Forest Service responsibilities relative to project-level planning outlined in the MOU are as follows:

> Within the NEPA process, evaluate the effects of agency actions on migratory birds, focusing first on species of management concern along with their priority habitat and key risk factors. To the extent practical: evaluate and balance long-term benefits of projects against any short-term or long-term adverse effects; pursue opportunities to restore or enhance the composition, structure, and juxtaposition of migratory bird habitats in the project area; consider approaches for identifying and minimizing incidental take (altering season of activities; retaining snags where underrepresented; retaining integrity of known breeding sites); and coordinate with FWS when a project is likely to have a negative effect on migratory bird populations.

Birds of conservation concern have been identified by the USFWS (2008). Their report identifies criteria for selection, as well as their rationale for selection of Bird Conservation Regions (BCRs) as the smallest geographic scale. The project area lies in BCR 10. The birds of conservation concern for BCR 10 are shown in table 66.

Three of these species have already been addressed as sensitive species (bald eagle, peregrine falcon and flammulated owl). Of the remaining species, Swainson's hawk, calliope hummingbird, Williamson's sapsucker, olive-sided flycatcher, willow flycatcher, black rosy finch, and Cassin's finch may be found in the analysis area, based on known distribution and habitats present in the analysis area (table 67).

Table 66. Birds of conservation concern

Species	Habitat or Structural Component	Species or Habitat Likely Present in Project Area	Forest Service Sensitive Yes/No
Bald eagle	River or lake habitat	Not likely. Addressed as sensitive species	Yes
Swainson's hawk	Shrubsteppe, prairies, open woodlands	Yes, R1 landbird detection 2004.	No
Ferruginous hawk	Dry open country including native prairie, but also shrubsteppe, plains	Not likely in project area due to habitat used.	No
Peregrine falcon	Nests on cliffs	No detections on NFS lands. No MNHP point detections.	Yes
Upland sandpiper	Prairie grasslands, but also wet and dry meadows, hayfields	Not likely. No MNHP point detections.	No
Long-billed curlew	Shortgrass and grazed mixed-grass prairies	Not likely in project area due to habitat used.	No

Species	Habitat or Structural Component	Species or Habitat Likely Present in Project Area	Forest Service Sensitive Yes/No
Yellow-billed cuckoo	Found west of Continental Divide; uses cottonwood willow riparian bottoms	Not likely No MNHP point detections.	No
Flammulated owl	Mature ponderosa pine but also PP/Douglas-fir	Yes, addressed as sensitive species	Yes
Black swift	Steep cliffs, canyons, nest on rock behind waterfalls	Not likely. No MNHP point detections.	No
Calliope hummingbird	Montane shrubland, meadows, burned areas	Potential. No MNHP point detections.	No
Lewis' woodpecker	Open forest and woodland, primarily PP as well as riparian cottonwood	Not likely in project area based on habitat used.	No
Williamson's sapsucker	Montane conifer forest as well as aspen woodland	Yes. R1 landbird survey detections in 2002 and 2004.	No
White-headed woodpecker	Open coniferous and deciduous forest	Not likely. No MNHP point detections.	No
Olive-sided flycatcher	Montane conifer forest, especially burned areas with snags	Yes, R1 landbird survey detections in 1995, 1998, 2002.	No
Willow flycatcher	Dense willow thickets; low, dense, riparian woodland	Yes, habitat likely. R1 landbird survey detections in 2000.	No
Loggerhead shrike	Open areas	Not likely. No MNHP point detections.	No
Sage thrasher	Lower elevation shrubsteppe, sagebrush communities	Not likely. No MNHP point detections.	No
Brewer's sparrow	Shrubsteppe, shortgrass prairie with scattered shrubs	Not likely. No MNHP point detections.	No
Sage sparrow	Shrubsteppe, especially sagebrush dominated	Not likely. No MNHP point detections.	No
McCown's longspur	Shortgrass prairie, heavily grazed mixed-grass prairie	Not likely. No MNHP point detections.	No
Black rosy finch	Alpine tundra in summer, lower on mountain slopes in winter	Possible., In alpine habitats, southern portion of project area	No
Cassin's finch	Open stands of drier montane coniferous forests and woodlands	Yes, R1 landbird survey detections in 1994, 2002	No

Environmental Consequences

Alternative 1 – No Action

Direct, Indirect, and Cumulative Effects

For alternative 1, there would be no direct, indirect or cumulative effects to migratory birds or habitat from the Flint Foothills Vegetation Management Project because no project activities are proposed.

Alternatives 2 and 3

Direct and Indirect Effects

This proposal would result in changes to stand structure and species composition through salvage, thinning, prescribed burning, and precommercial thinning. This also includes disturbance effects due to increased traffic, human activity, and equipment use during project activities. Species that may be in the project area were carried forward from table 66 and are shown in the following table 67 along with how project activities would affect habitat components.

Table 67. Birds of conservation concern that may be in the project area, and effects to habitat or components from project activities

Species	Project Activities That Could Affect Habitat	How This Project Affects Habitat and Components
Swainson's hawk	No treatments proposed in suitable habitats.	No effect to suitable habitats.
Calliope hummingbird	No treatments proposed in suitable habitats.	No effect to suitable habitats.
Williamson's sapsucker	LPP salvage, DF/PP commercial	Retention of large diameter trees and snags for nesting. Salvage of dead lodgepole pine may affect habitat availability within treatment units by removing snags up to 20 inches d.b.h. Snag retention within treatment units according to Forest Plan standards, as well as snags available in untreated areas are expected to contribute to suitable habitat.
Olive-sided flycatcher	LPP salvage, DF/PP commercial; Prescribed burn	Snags available across project area, All treatments retain all trees (live and dead) greater than 20" d.b.h. Treatments that remove snags greater than 15 inches d.b.h. may affect habitat availability within treatment units. Snag retention within treatment units according to Forest Plan standards, as well as snags available in untreated areas are expected to contribute to suitable habitat. Treatments increase openings/edge habitat.
Willow flycatcher	No treatments proposed in suitable habitats.	No effect to suitable habitats.
Black rosy finch	No treatments proposed in suitable habitats.	No effect to suitable habitats.
Cassin's finch	DF/PP commercial; Prescribed burn	Treatments in Douglas-fir would maintain open stand structure in dry conifer nesting and foraging habitats.

Several factors influence the richness and diversity of bird species in a stand, including the structure and composition of living and dead vegetation. In western dry coniferous forests, bird community composition depends on the heterogeneity of habitats available, proximity to water, fire history and silvicultural legacy (Pilliod et al. 2006). The species most likely to be affected by vegetation treatments are those with nesting and foraging habitats associated with the vegetation being affected, and species that either prefer or avoid disturbed areas. There is the potential for short-term direct effects to some individuals during breeding season, depending on timing of harvest or treatment.

Hejl et al. (1995) reviewed species abundance following silvicultural treatments. Each species responded uniquely to the harvesting treatments. Of the forest-associated species listed above that they considered, calliope hummingbirds showed a positive response to partial cuts (no data on clearcuts); olive-sided flycatchers showed a positive response to low-shrub and tall-shrub clearcuts and partial cuts (no data on pole-sapling clearcuts); and Cassin's finch showed no change in low-shrub clearcuts, a decrease in tall-shrub clearcuts and positive responses in pole-sapling clearcuts and partial cuts.

Openings created by lodgepole pine salvage and stand density reductions in Douglas-fir/ponderosa pine thinning units, and seed tree harvest are expected to improve habitats for olive-sided flycatchers. Large conifer and snag retention in thinning units would retain suitable nest sites for Williamson's sapsuckers. In addition, aspen improvements associated with Douglas-fir thinning and seed tree harvest would increase future nesting opportunities in aspen for this species. Stand density reductions generated by thinning, seed tree harvest, and prescribed burning in Douglas-fir and ponderosa pine stands would increase suitable habitats for Cassin's finch.

Cumulative Effects

The cumulative effects analysis area for migratory birds is the project area. Past activities such as timber harvest, road construction, livestock grazing, mining, and wildfire suppression have contributed to the existing condition. Present and foreseeable activities that may impact migratory birds consist of roadside salvage and woodcutting. Because acreage affected by both activities is minor at the project scale, cumulative effects resulting from ongoing and foreseeable activities in combination with activities from alternatives 2 and 3 are not expected to impact migratory bird populations.

Summary of Effects

Forest Plan vegetation management direction is designed to restore, maintain and retain a range of landscape conditions under which species evolved. See table 27 for the percentage of habitats that would be affected on BDNF lands. Potential impacts of activities would be minimized by adherence to Forest Plan standards for habitat components including snags, large woody debris and buffers from mechanized equipment in riparian areas. Overall, both action alternatives would maintain or improve habitats for these species and would not negatively impact migratory landbird populations or their habitats.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The Plan includes a standard that states "…the Northern Region Lynx Management Direction (2007) is included in Appendix G and will apply to the BDNF as described in the Northern Rockies Lynx Management Direction". Direction on occupied and unoccupied lynx habitat was

provided in a letter from the Regional Forester in 2009. This letter directs unoccupied forests to consider lynx management direction using the Northern Rockies Lynx Management Direction Standards and Guidelines Consistency Evaluation Table for Project Specific Activities. This has been done and is found in Attachment A to the Wildlife Report and in the preceding analysis. There are four vegetation standards that apply directly to this project (Veg S1, Veg S2, Veg S5 and VegS6). As discussed in this analysis, alternatives 2 and 3 would both meet Veg S1 and Veg S2. However, implementation of the project would be inconsistent with Northern Region direction pertaining to standard Veg S5 due to proposed precommercial thinning in units 36P and 39P. The project may also be inconsistent with standard Veg S6 if pending verification of suitable snowshoe hare habitat is verified within treatment units.

Soil Resources

Introduction

This section describes the geology, landforms, and soil present in the Flint Foothills Project area, and analyzes the impact to the soil resource from implementation of the proposed actions. The main issues concerning the soil resource include existing soil disturbance from previous activities within the project area, and the potential direct, indirect, and cumulative effects of the commercial timber harvest and prescribed burn components of the proposed action to the soil resource.

The precommercial thin component of the proposed action is not discussed in detail because no effects to the soil resource are expected. All work would be done by hand (i.e., hand felling of trees and hand piling); no mechanical treatments would occur.

Overview of Issues Addressed

Issues associated with soil productivity and quality include evaluation of existing detrimental soil disturbances from past and present activities, as well as potential effects to the soil resource from new disturbances related to implementation of proposed commercial harvest and prescribed burning activities. Potential soil productivity effects from the commercial timber harvest component of the proposed action are soil erosion, compaction, rutting, and displacement from machinery during felling, bunching, yarding, loading logs and temporary road construction, as well as soil heating from slash burning, and reduction in site nutrient capital due to the removal of woody material from the site. Potential soil productivity effects from the prescribed burning component of the proposed action are soil heating and potential accelerated erosion as a result of loss of surface cover due to burning.

Measurement Indicators

The measurement indicators used to evaluate impacts of alternatives:

As defined by the Region 1 Soil Quality Standards (1999), detrimental soil disturbance (DSD) includes the effects of compaction, rutting, displacement, severe burning, surface erosion, loss of surface organic matter, and soil mass movement. At least 85 percent of an activity area must have soil that is in satisfactory condition. An activity area is defined as: “A land area affected by a management activity to which soil quality standards are applied. Activity areas must be feasible to monitor and include harvest units within timber sale areas, prescribed burn areas, grazing areas or pastures within range allotments, riparian areas, recreation areas, and alpine

areas. All temporary roads, skid trails and landings are considered part of an activity area" (USDA Forest Service 1999).

Detrimental soil conditions include:

- **Compaction:** Detrimental compaction is a 15 percent increase in natural bulk density. The cumulative effects of multiple site entries on compaction should also be considered since compacted soils often recover slowly.
- **Rutting:** Wheel ruts at least 2 inches deep in wet soils are detrimental.

  Displacement: Detrimental displacement is the removal of 1 or more inches (depth) of any surface horizon, usually the A horizon, from a continuous area greater than 100 square feet.
- **Severely-burned soils:** Physical and biological changes to soil resulting from high intensity burns of long duration are detrimental. This standard is used when evaluating prescribed fire. Guidelines for assessing fire intensity are contained in the Burned-Area Emergency Rehabilitation Handbook FSH 2509.13 (USDA Forest Service 1995).
- **Surface Erosion:** Rills, gullies, pedestals, and soil deposition are all indicators of detrimental surface erosion. Minimum amounts of ground cover necessary to keep soil loss to within tolerable limits (generally less than 1 to 2 tons per acre per year) should be established locally depending on site characteristics.
- **Soil Mass Movement:** Any soil mass movement caused by management activities is detrimental.

The R1 SQS refers to the Burned-Area Emergency Rehabilitation Handbook FSH 2509.13 (USDA Forest Service 1995) for assessing fire intensity. However, more currently, fire effects to the soil are defined in terms of soil burn severity in order to differentiate between post-fire soil properties from fire effects on vegetation (Parsons et al. 2010). This distinction is important as fire intensity and soil burn severity do not necessarily correlate directly. High soil burn severity would be considered detrimental soil disturbance. The following definitions from Parsons et al. 2010 will be used in the effects analysis.

- **Soil burn severity:** The effect of a fire on ground surface characteristics, including char, depth, organic matter loss, altered color and structure, and reduced infiltration (Lentile and others 2006; Debano and others 1998; Ryan and Noste 1985). The classification of post-fire soil condition is based on fire-induced changes in physical and biological soil properties.
- **Low soil burn severity:** Surface organic layers are not completely consumed and are still recognizable. Structural aggregate stability is not changed from its unburned condition, and roots are generally unchanged because the heat pulse below the soil surface was not great enough to consume or char any underlying organics. The ground surface, including any exposed mineral soil, may appear brown or black (lightly charred), and the canopy and understory vegetation will likely appear "green."
- **Moderate soil burn severity:** Up to 80 percent of the pre-fire ground cover (litter and ground fuels) may be consumed but generally not all of it. Fine roots (~0.1 inch or 0.25 cm diameter) may be scorched but are rarely completely consumed over much of the area. The color of the ash on the surface is generally blackened with possible gray patches. There may be potential for recruitment of effective ground cover from scorched needles or leaves remaining in the canopy that will soon fall to the ground. The prevailing color of the site is often "brown" due to canopy needle and other vegetation scorch. Soil structure is generally unchanged.

- **High soil burn severity:** All or nearly all of the pre-fire ground cover and surface organic matter (litter, duff, and fine roots) is generally consumed, and charring may be visible on larger roots. The prevailing color of the site is often "black" due to extensive charring. Bare soil or ash is exposed and susceptible to erosion, and aggregate structure may be less stable. White or gray ash (up to several centimeters in depth) indicates that considerable ground cover or fuels were consumed. Sometimes very large tree roots (>3 inches or 8 cm diameter) are entirely burned extending from a charred stump hole. Soil is often gray, orange, or reddish at the ground surface where large fuels were concentrated and consumed.

Existing and Predicted Soil Disturbance

Soil disturbance is an indicator of departure from natural conditions and may negatively affect soil productivity when detrimental. Soil productivity is defined as "the inherent capacity of the soil resource to support appropriate site-specific biological resource management objectives, which includes the growth of specified plants, plant communities, or a sequence of plant communities to support multiple land uses" (USDA Forest Service 2010). The Region 1 Soil Quality Standards (USDA Forest Service 1999) defines the degree and aerial extent of soil disturbance to maintain soil productivity, thus meeting the intent of NFMA. The Forest Soil Disturbance Monitoring Protocol (FSDMP) was used to assess existing, management-caused soil disturbance in the proposed harvest units (USDA Forest Service, 2009b). Existing soil disturbance is displayed as a percentage of each proposed harvest unit.

Soil disturbance resulting from implementation of the proposed action was predicted for each proposed harvest unit using assumptions based on local monitoring data, literature, and risk ratings from the landtype inventory soil map. Predicted soil disturbance is displayed as a percentage of each proposed harvest unit.

Coarse Woody Debris

Coarse woody debris (CWD) is one soil quality indicator which influences soil hydrology, biology, nutrient cycling, and soil stability and support functions which are indicators of soil productivity (USDA Forest Service 2010). The removal of woody material from the site is common due to whole tree harvesting practices. The R1 supplement to FSM 2550 recommends following the guidelines set forth in Graham et al. 1994 in determining the amount of coarse woody debris to be left onsite. Coarse woody debris is defined as pieces 3 inches or greater in diameter. Baseline coarse woody debris measurements (in tons/acre) were taken in the proposed harvest units to address coarse woody debris recommendations.

Affected Environment

Existing Condition

Soils, Landforms, and Geology

Soil development is affected by climate, parent material, topography, living organisms, and the amount of time the soil has developed. Local climate near the project area in Deer Lodge, MT is cold and relatively dry, with an annual average maximum temperature of 55.6 degrees, an annual average minimum temperature of 26.0 degrees, and an annual average of 10.78 inches of precipitation (Western Regional Climate Center, accessed 1/23/12). In general, the combination of a cold, moderately dry climate, and a relatively short time for development have resulted in somewhat moderately developed soils. The majority of the soils in the proposed

harvest units have formed in undifferentiated parent material (mostly consisting of calcareous and noncalcareous sedimentary and metasedimentary materials) on mountain slopes and moraines. The most common soil type found within the commercial harvest units is Loamy-skeletal, mixed, superactive Typic Eutropcryepts.

Table 1 in the Soils Report in the project file displays the landtypes, geology, landforms and dominant soils types found in the commercial timber harvest units.

No commercial harvest units, precommercial thin units, or prescribed burn units fall within landtypes with a major wet soil component (USDA Forest Service 2007a). Eight landtypes list wet soils as a minor component comprising 15 percent or less of the map. These map units have limited areas of wet soils and the casual observer would not be aware that wet soils were a component of the landtype. Furthermore, the vegetative components associated with the minor wet components (subalpine-fir/bluejoint and meadows) do not correspond to the vegetation where treatments will occur.

Landtype Inventory Soil Map and Interpretations

The landtype inventory soil map is an appropriate scale to display soil interpretations for management. Soil survey data are interpreted to estimate the risk that management activities will affect soils. These risk estimates, or risk ratings, are called soil interpretations (USDA Forest Service 2007a, USDA Forest Service 2011a).

Soil Hazard Ratings: Erosion, Rutting, Compaction, and Mass Movement

Soils were rated for their susceptibility to erosion, rutting, compaction, and mass movement (USDA Forest Service 2007a, USDA Forest Service 2011a). These ratings, or interpretations, for the landtype inventory are qualitative ratings based on field observations of past activities, the inherent characteristics of each landtype (such as texture or rock content), and assumptions about the general modifications that would occur in the landtype as a result of management activities. Field observations of soil impacts on various landtypes formed the core of data used to develop the interpretive ratings. The landtypes with the field observations were rated first. The remaining landtypes were rated relative to those with field observations. Landtype characteristics were used as criteria for comparison and evaluation in the rating process.

The landtype inventory soil map was used to determine risk ratings for each commercial timber harvest unit associated with the proposed action for both alternative 2 and alternative 3 (table 68). Many of the proposed commercial timber harvest units contain more than one landtype, often resulting in multiple risk ratings for one unit. Each unique risk rating representing at least 0.50 acre is displayed. Risk ratings are defined in appendix A of the Soils report in the project file.

Table 68. Risk rating for erosion, rutting, compaction, and mass movement by unit

Soils Risk Ratings for the Flint Foothills Project Area				
Unit	**Erosion Hazard**	**Rutting Hazard**	**Compaction Hazard**	**Mass Movement Hazard**
1ST	High-Moderate	Slight	Slight	Slight
1ST	High-Moderate	Slight	Moderate	Slight
1ST	High	Slight	Moderate	Slight
5ST	High-Moderate	Slight	Moderate	Slight
5ST	High-Moderate	Slight	Slight	Slight
6C	Slight-Moderate	Slight	Slight	Slight
6C	Moderate	Slight	Slight	Slight
6C	High	Slight	Slight	Slight
8C	Moderate	Slight	Slight	Slight
8C	High-Moderate	Slight	Slight	Slight
10C	Slight-Moderate	Slight	Slight	Slight
11C	Slight-Moderate	Slight	Slight	Slight
12C	Moderate	Slight	Slight	Slight
12C	High-Moderate	Slight	Slight	Slight
16S	Slight-Moderate	Slight	Slight	Slight
19S	High-Moderate	Slight	Slight	Slight
20C	Slight-Moderate	Slight	Slight	Slight
20C	Moderate	Slight	Slight	Slight
20C	High-Moderate	Slight	Slight	Slight
20C	High	Slight	Slight	Slight
20C	High	Slight	Moderate	Slight
22C	High-Moderate	Slight	Slight	Slight
23C	Moderate	Slight	Slight	Slight
23C	High-Moderate	Slight	Slight	Slight
23C	High	Slight	Slight	Slight
24C	Moderate	Slight	Slight	Slight
24C	High-Moderate	slight	Slight	Slight
25C	High-Moderate	Slight	Slight	Slight
25C	High-Moderate	Slight	Moderate	Slight
25C	High	Slight	Moderate	Slight
26S	High-Moderate	Slight	Slight	Slight
27ST	Slight-Moderate	Slight	Slight	Slight
27ST	Moderate	Moderate	Moderate	High
27ST	Moderate	Slight	Slight	Slight
27ST	Moderate	Slight	Moderate	Slight
28C	High-Moderate	Slight	Slight	Slight

Soils Risk Ratings for the Flint Foothills Project Area				
Unit	**Erosion Hazard**	**Rutting Hazard**	**Compaction Hazard**	**Mass Movement Hazard**
29C	High-Moderate	Slight	Slight	Slight
30ST	High-Moderate	Slight	Slight	Slight
31C	High-Moderate	Slight	Slight	Slight
32ST	High-Moderate	Slight	Slight	Slight
33C	High-Moderate	Slight	Slight	Slight
34S	Slight-Moderate	Slight	Slight	Slight
35S	Slight-Moderate	Slight	Slight	Slight
36S[a]	Slight-Moderate	Slight	Slight	Slight
36S[a]	Moderate	Slight	Slight	Slight
37S	Slight-Moderate	Slight	Slight	Slight
37S	Moderate	Moderate	Moderate	High
39S	Slight-Moderate	Slight	Slight	Slight
40S	Slight-Moderate	Slight	Slight	Slight
40S	Moderate	Slight	Slight	Slight
41S	Slight-Moderate	Slight	Slight	Slight
42C	Slight-Moderate	Slight	Slight	Slight
43S	Slight-Moderate	Slight	Slight	Slight
43S	High-Moderate	Slight	Slight	Slight
44S	Slight-Moderate	Slight	Slight	Slight
44S	Moderate	Slight	Slight	Slight
45S	Slight-Moderate	Slight	Slight	Slight
45S	Slight-Moderate	Moderate	Moderate	Slight
46S	Slight-Moderate	Slight	Slight	Slight
46S	Moderate	Slight	Slight	Slight
46S	High-Moderate	Slight	Slight	Slight
47S[a]	Moderate	Slight	Slight	Slight
48C[a]	Moderate	Slight	Slight	Slight
48C[a]	High-Moderate	Slight	Slight	Slight
49S	Slight-Moderate	Slight	Slight	Slight
50S	Slight-Moderate	Slight	Slight	Slight
50S	Moderate	Slight	Slight	Slight
51S	Slight-Moderate	Slight	Slight	Slight
51S	High-Moderate	Slight	Slight	Slight
52S	Moderate	Slight	Slight	Slight
52S	Slight-Moderate	Slight	Slight	Slight
52S	High-Moderate	Slight	Slight	Slight
55C	High-Moderate	Slight	Moderate	Slight

Soils Risk Ratings for the Flint Foothills Project Area				
Unit	**Erosion Hazard**	**Rutting Hazard**	**Compaction Hazard**	**Mass Movement Hazard**
55C	High	Slight	Moderate	Slight
56C[a]	Moderate	Slight	Slight	Slight
57C[a]	Moderate	Slight	Slight	Slight
57C[a]	High	Slight	Slight	Slight
58S	Slight-Moderate	Slight	Slight	Slight
58S	Moderate	Slight	Slight	Slight
59C	High	Slight	Moderate	Slight
60C	High-Moderate	Slight	Slight	Slight
61S	Slight-Moderate	Slight	Slight	Slight
61S	Moderate	Slight	Slight	Slight
61S	High-Moderate	Slight	Slight	Slight
62S	Slight-Moderate	Slight	Slight	Slight
62S	High-Moderate	Slight	Slight	Slight
64C	Slight-Moderate	Slight	Slight	Slight
64C	High-Moderate	Slight	Slight	Slight
65C	Slight-Moderate	Slight	Slight	Slight
65ST	Slight-Moderate	Slight	Slight	Slight
65ST	Moderate	Moderate	Moderate	High
66C	Slight-Moderate	Slight	Slight	Slight
67C	Moderate	slight	Slight	Slight
68C[a]	High-Moderate	Slight	Slight	Slight
69S	Slight-Moderate	Slight	Slight	Slight
71C[a]	Moderate	slight	Slight	Slight
71C[a]	High-Moderate	Slight	Slight	Slight
72S[a]	High-Moderate	Slight	Slight	Slight
73S	High	Slight	Moderate	Slight
73S	High-Moderate	Slight	Slight	Slight
74S	High-Moderate	Slight	Moderate	Slight
74S	Slight-Moderate	Slight	Slight	Slight
74S	High-Moderate	Slight	Slight	Slight
76S	High-Moderate	Slight	Slight	Slight
77S[a]	Moderate	Slight	Slight	Slight
78S[a]	Moderate	Slight	Slight	Slight
78S[a]	High-Moderate	Slight	Slight	Slight
79S	Slight-Moderate	Slight	Slight	Slight
80C	Slight-Moderate	Slight	Slight	Slight
80C	High-Moderate	Slight	Slight	Slight

Soils Risk Ratings for the Flint Foothills Project Area				
Unit	**Erosion Hazard**	**Rutting Hazard**	**Compaction Hazard**	**Mass Movement Hazard**
81C	Slight-Moderate	Slight	Slight	Slight
81C	High-Moderate	Slight	Slight	Slight

[a] Units only pertain to alternative 2.

Existing Soil Disturbance

Detrimental soil disturbance in the form of compaction, rutting, or displacement exists in 5 units out of 65 in alternative 2 and 3 combined (table 69). Field data for five units was not collected, therefore, the DSD is assumed to be zero until the data is in. Soil disturbance was noted as compaction, rutting, and displacement. The disturbance was caused by former harvest as well as livestock.

Table 69. Percent existing detrimental soil disturbance by commercial harvest unit

Commercial Harvest Unit	Percent Compaction	Percent Rutting	Percent Displacement	Percent Total DSD
25C	3.3	0.0	0.0	3.3
27ST[a]	0.0	0.0	0.0	0.0
28C[a]	0.0	0.0	0.0	0.0
31C[a]	0.0	0.0	0.0	0.0
32ST	8.7	0.0	0.0	8.7
40S	6.7	0.0	0.0	6.7
64C	0.0	0.0	3.3	3.3
65ST	0.0	3.3	0.0	3.3
68C[ab]	0.0	0.0	0.0	0.0
74S[a]	0.0	0.0	0.0	0.0

[a]No field data available for unit. DSD assumed to be zero until field data collected. [b]Units only pertain to alternative 2.

Coarse Woody Debris

Baseline coarse woody debris measurements (in tons/acre) were collected in each proposed harvest unit to address coarse woody debris recommendations in the R1 supplement to FSM 2550 (Graham et al. 1994; Brown 1974). Coarse woody debris measurements within the proposed harvest units ranged from 1 to 17 tons/acre, with an average of 6 tons/acre (table 70).

Table 70. Existing coarse woody debris (ton/ac) by commercial harvest unit

Unit	Coarse Woody Debris (ton/ac)	Unit	Coarse Woody Debris (ton/ac)	Unit	Coarse Woody Debris (ton/ac)
1ST	2	35S	6	59C	1
5ST	4	36S[a]	15	60C	3
6C	1	37S	6	61S	3
8C	4	39S	3	62S	5

Unit	Coarse Woody Debris (ton/ac)	Unit	Coarse Woody Debris (ton/ac)	Unit	Coarse Woody Debris (ton/ac)
10C	3	40S	10	64C	3
11C	4	41S	7	65ST	5
12C	5	42C	3	65C	17
16S	11	43S	1	67C	5
19S	8	44S	7	69S	7
20C	2	45S	9	71C	6
22C	4	46S	8	72S[a]	4
23C	5	47S[a]	6	73S	3
24C	2	48C[a]	6	76S	4
25C	1	49S	6	77S[a]	6
26S	3	50S	1	78S[a]	6
29C	2	51S	16	79S	17
30ST	3	56C[a]	5	80C	7
32ST	5	57C[a]	14	81C	1
34S	4	58S	5		

[a] Units only pertain to alternative 2

Desired Condition

The desired condition for the soil resource is the maintenance of soil productivity. Under NFMA, the Forest Service may harvest timber from national forests only where “soil, slope, or other watershed conditions will not be irreversibly damaged.” 16 U.S.C. § 1604(g)(3)(E)(i).

The Beaverhead-Deerlodge Forest Plan states that ground based yarding shall not be allowed on slopes exceeding 35 percent without site-specific environmental analysis that shows damage is unlikely and soil goals and objectives can be met (USDA Forest Service 2009c). The plan also states that the most current Region 1 Soil Quality Standards (SQS) are adopted as Forest Plan soil standards.

Region 1 SQS address NFMA by requiring that new activities do not create detrimental soil conditions on more than 15 percent of an activity area following project implementation and restoration activities (USDA Forest Service 1999). Restoration is defined as treatments that restore vital soil functions to their inherent range of variability. Restoration treatments could include, but are not limited to, tillage, ripping, subsoiling, seeding, mulching, recontouring of temporary roads, and water barring. Activity areas are defined as the proposed harvest units, including landings, skid trails, and temporary road construction, and the proposed prescribed burning units. As defined by the Region 1 Soil Quality Standards, detrimental soil disturbance includes the effects of compaction, displacement, rutting, severe burning, surface erosion, loss of surface organic matter, and soil mass movement.

According to the R1 supplement to FSM 2550, coarse woody debris objectives should follow research guidelines such as those contained in Graham et al. 1994. Leaving 7-25 tons/acre of pieces with a diameter of 3 inches or greater meets recommendations set forth in Graham et al. for habitat types present in the project area. For practical purposes, a range of 7-12 tons/acre should be left in each unit (project design features and mitigation measures, chapter 2).

Environmental Consequences

Methodology

Existing Detrimental Soil Disturbance

Existing detrimental soil disturbance (DSD) was determined by Forest Service soil scientists with onsite visits to timber harvest units occurring August 2010 and August through October 2011. The Forest Soil Disturbance Monitoring Protocol (FSDMP) was used to assess existing, management-caused soil disturbance in the proposed harvest units (USDA Forest Service, 2009b). The FSDMP is applied to areas disturbed by management activities, and is a presence/absence (1 = present, 0 = absent) method of collecting visual attribute data in order to assess soil disturbance. Attributes evaluated include forest floor impacts, surface soil displacement, mixed surface soil/subsoil, rutting, burning (only management prescribed burning is assessed), compaction, and platy or massive structure.

If previous management activities or disturbance were evident, 30 sample plots were spaced across the unit to obtain an estimate of the amount and extent of soil disturbance. A sample plot consisted of a 6-inch diameter circular area. Determinations of detrimental soil disturbance were based on the Region 1 Soil Quality Standards (USDA Forest Service 1999). If no evidence of past management or disturbance was present, then a walk-through of the unit was conducted and documented.

Coarse Woody Debris

Baseline coarse woody debris measurements (in tons/acre) were taken in most of the proposed harvest units following Brown 1974. Random azimuth transects were run at plots 5, 10, 15, 20, and 25 for those units with 30 sample plots. Five random azimuth transects spaced throughout the unit were run in walk-through units.

Predicted Detrimental Soil Disturbance

To predict the amount of detrimental soil disturbance (DSD) associated with the proposed action, the following assumptions were made:

- Projected DSD associated with the proposed action is assumed to be 10 percent for each activity area (commercial harvest unit) harvested under dry conditions in the summer. This assumption is based on local data, which shows that DSD is typically less than 10 percent in the summer (USDA Forest Service 2004; USDA Forest Service 2008; USDA Forest Service 2009a; USDA Forest Service 2009d). The estimate above includes landings, skid trails, and temporary road construction associated with the activity areas. Detrimental soil disturbance associated with burning slash piles is also included with these figures since landings were included in the post-implementation monitoring. Projected DSD associated with broadcast burning in the commercial thin and seed trees units is assumed to be 0 percent. This assumption is based on local data which has shown low soil burn severity (not detrimental) is typical of broadcast and concentration prescribed burning (Fletcher 2011b).
- In addition to the baseline 10 percent (summer harvest) assumed for each activity area, DSD due to temporary road construction associated with each harvest unit was calculated. Acres of disturbance were calculated by multiplying a width of 14 feet by the length of proposed road. This may result in an overestimation of DSD, but aids in displaying the effects of temporary road construction needed for some of the harvest units. All temporary road construction is considered DSD. Existing roads that would be maintained or

reconstructed are not counted towards DSD, since they are already removed from the productive soil base. Existing unauthorized routes to be used as haul roads that would not be added as System roads are counted towards DSD. Newly constructed temporary roads would be obliterated, and hence restored to some degree (assuming 50 percent effectiveness—see Effectiveness to Restore DSD that follows) after harvest is completed. Existing unauthorized routes would be decommissioned by use of signs and berms; therefore 0 percent of these temporary roads would be restored after harvest is completed.

- Net DSD reflects cumulative DSD as a result of project implementation. Net DSD is predicted by adding existing DSD, projected DSD, and DSD associated with haul routes on nonsystem roads (includes temporary roads), and then crediting the restoration (50 percent) of haul routes. It is important to note that these figures are likely an overestimation of cumulative DSD at the end of project implementation. In units with existing skid trails and landings, DSD is essentially double-counted. The existing skid trails and landings are likely to be reused rather than disturbing new areas; however, the existing disturbances are counted under existing DSD and projected DSD.
- Projected DSD associated with the proposed action is assumed to be 0 percent for each prescribed burn unit. This assumption is based on local data, which shows low soil burn severity (not detrimental) is typical of broadcast and concentration prescribed burning (Fletcher 2011b).

Soils Restoration Plan

- For all units with newly constructed temporary roads (12C, 20C, 27ST, 34S, 35S, 41S, 42C, 46S, 48C, 49S, 51S, 52S, 55C, 56C, 57C, 61S, 68C, 71C, 72S, 73S, 77S,78S,79S) all temporary roads (new construction) would be ripped or subsoiled, seeded with native seed, and blocked at the entrance. Roads would be recontoured where needed.
- For three units (32ST, 40S, and 41S) additional restoration may be required to comply with the regional soil quality standards. In these units existing and/or new skid trails would be subsoiled to reduce compaction. Restoration activities would focus on skid trails and landings and would occur on suitable acres, excluding areas that are too rocky, wet, or have other limiting factors. Restoration would be implemented on the number of acres needed to meet soil quality standards; actual acres restored may be higher or lower than what is shown (table 72). Treatments would occur within 3 years of completion of harvest.
- Actual acres to be restored would be determined by post-harvest monitoring to determine the actual percent detrimental soil disturbance from which actual acres to be restored can be calculated. These units would need to be monitored to ensure that SQS are met within 3 years of the conclusion of the project.

Predicted Soil Erosion Using Disturbed WEPP

The Disturbed WEPP model (Elliot and Hall 2010) was run to generate predicted erosion rates for the existing condition and following implementation of the proposed harvest. The following assumptions were made:

- Units with the greatest erosion hazard (high) were used to represent the worst case scenario for the proposed actions (table 68); only these units were modeled.
- The Deerlodge, MT local climate was modified to reflect elevation within the project area. All runs were based on 50 years of climate.
- Proposed commercial harvest units were assigned a vegetation/treatment category of thin or young forest, which reflects an area that has been harvested (Elliott et al. 2000).

- Eighty-five percent ground cover was assumed for harvest units to reflect no more than 15 percent DSD in each unit modeled (ground cover is likely disturbed or removed if the soil is detrimentally disturbed).

Design Feature and Mitigation Measure

Effectiveness of Preventing Detrimental Soil Disturbance

Monitoring conducted on previous vegetation management projects has proven soil and water conservation practices (SWCPs) to be effective in controlling the amount of DSD in activity areas. For example, the FY 2004 Monitoring Report (USDA Forest Service 2004) documents monitoring of BMP effectiveness on the West Face Timber Sale (p.30). Harvesting began on the West Face Timber Sale in winter 2001. The project area is in the Pioneer Mountains and soils are generally derived from the Pioneer Batholith, which is broadly quartz-monzonite composition. Quantitative monitoring of the West Face Sale showed that "detrimental disturbance was estimated at less than 10 percent overall" (FY 2004 Monitoring Report, p.30). The report attributes reductions in DSD found in recent projects, compared to 'historic' timber projects, to logging in the driest times of the summer and over snow, excluding harvest during the wetter spring months. Logging when the soil is dry or frozen is listed above in "Design Features and Mitigation Measures" for the proposed action, and is captured under SWCP 13.06.

The FY 2004 Monitoring Report also included monitoring in the Joe/Fox Sale (p. 93). Soils in the Joe/Fox sale are more uniformly susceptible to compaction than the soils found in the Flint Foothills project area, because they have surface layers of volcanic ash mixed in where soils in the Flint Foothills project area do not. Soils in the Joe/Fox sale also had a soil water content of 18 to 20 percent on the date sampled, moisture levels which increase susceptibility to compaction. Monitoring results demonstrated that 15 passes of normal machinery on moist soil caused a 6.2 percent and 9.4 percent increase in surface and subsurface bulk density, respectively. These values are considerably lower than the 15 percent threshold for detrimental compaction (USDA Forest Service 1999). The percentage change is expected to be even less on frozen or drier soils. Allowing soils to dry before using heavy equipment, (Soil Resources project design features and mitigation measures chapter 2) has been shown to be effective in minimizing soil compaction both locally as described above, and in the literature as well (Han et al. 2006). Designating skid trails (SWCP 14.08) has been shown to reduce soil compaction to 10 percent or less of an activity area from 25-30 percent of an area if skid trails are not designated (Adams and Froehlich, 1981). Monitoring of the Butte South Salvage Sale demonstrated the effectiveness of designating skid trails, allowing soils to dry prior to harvest activities, and placing slash on skid trails (USDA Forest Service 2007b). Ground cover in the units ranged from 87-93 percent after slash was placed on skid trails.

Burning slash piles when the soil is frozen or moist has been shown to protect the soil. Two landings in the West Face Timber Sale were monitored for detrimental burning. The piles were moist and were burned in the fall with frozen soil and 6 inches of snow. No severely burned soils were noted and vegetation is already returning (USDA Forest Service 2006, p.37). Burning slash piles when soils are approaching saturation near the surface reduces the heat load to the soil. A fuel pile burned on a wet mineral soil had 20 percent heat load compared with the heat load of a fuel pile burned on a dry mineral soil (Frandsen and Ryan 1986).

Effectiveness to Restore Detrimental Soil Disturbance

Compaction reduces infiltration rate of water into the soil, potentially reducing plant available water and affecting soil productivity. Compaction is the major detrimental soil condition

associated with temporary roads, landings and skid trails. Restoration activities that reduce compaction will restore infiltration and available water, thereby reducing the potential effects on productivity.

Subsoiling has been shown to be an effective tool in treating compacted soils over many soils and site conditions (Andrus and Froehlich 1983). Carr (1989) found that subsoiling successfully reduced the soil density of compacted soils on landings. Davis (1990) found that subsoiling areas compacted by brush piling reduced bulk density values to undisturbed levels. McNabb (1994) had only “moderate” success decompacting temporary roads and landings, and attributed the results to soil moisture levels being too high during subsoiling, which reduced the effectiveness of the treatment. Kolka and Smidt (2004) found that subsoiling roads as a method of decommissioning resulted in significantly greater white pine diameter growth and yellow-poplar height and diameter growth than the control treatment (planting cover crops) after two years. Much of the published research on the effectiveness of subsoiling comes from the Pacific Northwest; however, it is likely to work well on soils in the project area, as the technique has been proven successful on a variety of soil textures (Andrus and Froehlich 1983). Further, the Bitterroot NF has been successfully using subsoiling to treat their compacted soils for a few years (Mayn 2008). The Bitterroot National Forest Soil Scientist visited the BDNF to assess local soils in 2008; he predicted that subsoiling would be successful as long as the water content of the soils during treatment was optimal (not too dry or too wet).

Temporary road obliteration and subsequent reseeding has been shown to be an effective means of soil compaction restoration on the Beaverhead-Deerlodge National Forest. In order to evaluate the effectiveness of temporary road obliteration, temporary roads from the Butte South Salvage Sale were monitored 1 year after obliteration. Obliteration occurred in 2009 and included recontouring where necessary, seeding with native seed, and blocking the entrance of the road to prevent use. One year after obliteration, cover in the form of slash and native grasses was adequate (Fletcher 2011a). Areas of road that were recontoured did not have compacted soil within the top 12 inches of the surface. Where recontouring was not necessary, the top 4-6 inches of soil were not compacted, allowing vegetation to take hold (Fletcher 2011a).

The planned obliteration of constructed skid trails, temporary roads, and landings in the proposed action would re-establish slope hydrology and deter surface erosion that hinders natural recovery (Switalski et al. 2004). Using infiltration as a proxy for the recovery of compaction, road rehabilitation led to roughly 40 percent of the natural soil infiltration rate (Luce 1997, Foltz and Maillard 2003). Unreclaimed surfaces typically have almost no infiltration.

Restoration techniques improve the recovery trajectory. Standard timber sale contract/stewardship contract provisions for erosion control are proposed for constructed skid trails, temporary roads, and landings. Leaving slash on skid trails ensures hydrological and biological soil processes have been set up for recovery. For these road restoration treatments, 50 percent effectiveness is assumed for calculation of the DSD.

Incomplete and Unavailable Information

The following units were not field reviewed during 2010 and 2011: 27ST, 28C, 31C, 68C, and 74S. No information in regards to existing detrimental soil disturbance is available. For the Draft EIS, existing DSD will be assumed to be zero. Field data will be collected in 2012, between the Draft and Final EIS.

Spatial and Temporal Context for Effects Analysis

This analysis is largely focused on the commercial timber harvest component of the proposed action, as the activities associated with these treatments have greater potential to affect soil productivity than precommercial thin treatments and prescribed burn treatments.

The spatial context for the discussion of direct, indirect, and cumulative effects of the proposed action are the harvest units (activity areas), including skid trails, landings, and temporary roads associated with the proposed units. Effects to soils are generally confined to the site-specific location of activities (e.g., a harvest unit, a landing, etc.). With few exceptions, soil cumulative effects occur only when management activities occur on the same site.

Analyzing effects to soil at a landscape scale (i.e., by watershed) is inappropriate as it does not analyze soil disturbance using a site-specific activity area approach as considered under the Region 1 Soil Quality Standards (USDA Forest Service 1999). Additionally, due to the inherent variability of soil properties such as texture, organic matter and surface cover, and the variable soil response to previous management activities, it is not feasible to analyze past management effects on the soil at the landscape scale in a meaningful way.

The temporal context considered for soil effects analysis is 3 years. As described previously, the Region 1 Soil Quality Standards (USDA Forest Service 1999) address the National Forest Management Act (NFMA) by ensuring that soils will not be irreversibly damaged. Since soil quality standards are required to be met within 3 years of the close of the project (USDA Forest Service 2011b), soil productivity would be maintained over the short term. Additionally, soil recovery would occur in the years following implementation as vegetation reestablishes. For example, in comparing detrimental soil disturbance after post-fire salvage logging, a location that had a few years to recover before monitoring had less detrimental disturbance (4 percent) compared to a site that was monitored 1 year after the project was completed (28 percent) (Dumroese et al. 2006a). The study cited vegetative recovery as a reason for the difference between the locations. However, not all soils recover at the same rate. Recovery is largely dependent on the type of disturbance and the inherent characteristics of the soil in question. After 5 years, the surface 10 cm of severely compacted coarse-textured soils experienced some recovery while fine-textured soils showed little recovery in the same timeframe (Dumroese et al. 2006b). Similarly, after 16 years, a loamy soil showed no improvement in detrimental compaction found in skid trails (Rawinski and Dumroese 2008).

To assess the potential longer-term effects of post-fire salvage logging on soil quality, and to gauge soil recovery, a 7.5-acre unit less than 1 mile from Homestake Pass that burned in 1988 and was logged in 1989 was assessed in October, 2008 (internal monitoring). The unit currently meets lodgepole pine stocking levels. Thirty-four plots were taken across the unit; no detrimental disturbance was found. Soils in the unit are poorly developed sandy loams. The average litter depth was 1.58 cm; the average litter depth of a nearby unburned control was 2.5 cm. Live plants and fine woody debris were present in 94 percent of the plots. Bare mineral soil was present at 14.7 percent of the plots, but was not detrimental. Interestingly, 73.5 percent of the plots had some sort of biological soil crust present (e.g., moss and/or lichen species). Usually the crust was present along with grasses or other plants. Common and important in arid environments, biological soil crusts can take years to recolonize a site after fire (DeBano et al. 1998). The site appears to have mostly recovered since the fire and subsequent harvest. The harvest activities took place during the time when soil quality standards were in the beginning stages of development. At this time, awareness of the importance of reducing soil disturbance was increasing, but the current Region 1 numerical standards did not exist. The fact that no

detrimental soil disturbance was noted when this unit was monitored in 2008 speaks to the effectiveness of minimizing soil disturbance to protect long-term soil productivity, thus meeting the intent of NFMA.

Soils in the Homestake area were probably more detrimentally disturbed after salvage harvest (due to the combination of effects from wildfire and harvest) than soils found in the project area are projected to be after project implementation. Given these factors, and complying with the soil quality standards, and soil and water conservation practices (see Design Features and Mitigation Measures previously in this section), it is likely that the soil will have recovered to a large degree within 20 years of project implementation.

Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

Past management activities such as thinning and clearcutting have occurred throughout the project area; several units had existing detrimental soil compaction from past harvest activities. The effects from past timber management activities have been captured during onsite visits and are reflected in the existing detrimental soil disturbance.

Grazing is an ongoing activity within the project area; at least one the proposed harvest units have existing detrimental soil rutting attributed to livestock activity. The effects from ongoing grazing activities have been captured during onsite visits and are reflected in the existing detrimental soil disturbance.

Recreational activities such as fire wood retrieval and dispersed camping are also ongoing activities within the project area. The effects from recreational activities have been captured during onsite visits and are reflected in the existing detrimental soil disturbance.

The Roadside #4 Salvage Hazard Tree Removal project is currently ongoing within the project area. While Roadside #4 units do not overlap with proposed action units, skid trails to access the proposed units may cross the roadside harvest units.

Alternative 1 – No Action

Direct and Indirect Effects

Since no activities are proposed, there would be no direct or indirect effects to the soil resource. Natural processes would continue. Ongoing activities including recreational activities, grazing, and invasive plant species control would continue. Recreational activities such as firewood retrieval and dispersed camping may result in minor, localized ground disturbance. Cattle activity would generally be limited to cattle trails and comprise a very small amount of disturbance. The Invasive Plant section describes a low risk of spread and effective treatment of invasive plant species; therefore, the potential impact on soil productivity would be expected to be minimal (Rasor 2012).

Cumulative Effects

Soil cumulative effects generally occur only when management activities occur on the same site. Under the no-action alternative, there are no direct or indirect effects to the soil resource from project activities, and therefore no cumulative effects.

Alternative 2 – Proposed Action

Direct Effects

Commercial Timber Harvest

Potential direct environmental effects of the commercial timber harvest component of the proposed action on soil productivity include compaction, displacement, and rutting from machinery use during felling, bunching, skidding, processing and loading logs, as well as soil heating from slash and understory burning. All soils affected by commercial harvest are resistant to compaction and rutting when dry or frozen. Projected detrimental disturbance for each proposed harvest unit in alternative 2 was determined as described in the methodology section previously. Results for each unit are presented in table 71 that follows.

Haul routes on nonsystem roads include proposed newly constructed temporary roads and existing open and closed unauthorized routes. Proposed temporary roads (7.2 miles) would be obliterated, and hence restored to some degree (assuming 50 percent effectiveness, see Effectiveness to Restore DSD previously) after harvest is completed. Existing open and closed unauthorized routes (4.4 miles) would be decommissioned (table 6).

Table 71. Alternative 2 - Projected detrimental soil disturbance by harvest unit

A	B	C	D	E	F	G
Unit	**Existing Percent Detrimental Disturbance**	**Projected Percent Detrimental Disturbance with Proposed Action[b]**	**Percent Detrimental Disturbance Associated with Haul Routes on Non-System Roads**	**Total Percent Projected Detrimental Disturbance**	**Percent of Unit Restored Due to Temporary Road Obliteration and Subsoiling[c,d]**	**Net Percent DSD After Proposed Action and Restoration**
1ST	0.0	10.0	0.4	10.4	0.0	10.4
5ST	0.0	10.0	0.0	10.0	0.0	10.0
6C	0.0	10.0	0.0	10.0	0.0	10.0
8C	0.0	10.0	0.0	10.0	0.0	10.0
10C	0.0	10.0	0.0	10.0	0.0	10.0
11C	0.0	10.0	0.0	10.0	0.0	10.0
12C	0.0	10.0	0.6	10.6	0.2	10.4
16S	0.0	10.0	0.0	10.0	0.0	10.0
19S	0.0	10.0	0.0	10.0	0.0	10.0
20C	0.0	10.0	0.4	10.4	0.2	10.2
22C	0.0	10.0	0.0	10.0	0.0	10.0
23C	0.0	10.0	2.6	12.6	0.0	12.6
24C	0.0	10.0	0.0	10.0	0.0	10.0
25C	3.3	10.0	0.0	13.3	0.0	13.3
26S	0.0	10.0	0.0	10.0	0.0	10.0
27ST[a]	0.0	10.0	0.6	10.6	0.3	10.3

A	B	C	D	E	F	G
Unit	**Existing Percent Detrimental Disturbance**	**Projected Percent Detrimental Disturbance with Proposed Action[b]**	**Percent Detrimental Disturbance Associated with Haul Routes on Non-System Roads**	**Total Percent Projected Detrimental Disturbance**	**Percent of Unit Restored Due to Temporary Road Obliteration and Subsoiling[c,d]**	**Net Percent DSD After Proposed Action and Restoration**
28C[a]	0.0	10.0	0.0	10.0	0.0	10.0
29C	0.0	10.0	0.0	10.0	0.0	10.0
30ST	0.0	10.0	0.0	10.0	0.0	10.0
31C[a]	0.0	10.0	0.0	10.0	0.0	10.0
32ST	8.7	10.0	0.0	18.7	3.7	15.0
33C	0.0	10.0	0.0	10.0	0.0	10.0
34S	0.0	10.0	0.9	10.9	0.5	10.5
35S	0.0	10.0	1.2	11.2	0.6	10.6
36S	0.0	10.0	0.0	10.0	0.0	10.0
37S	0.0	10.0	0.0	10.0	0.0	10.0
39S	0.0	10.0	0.0	10.0	0.0	10.0
40S	6.7	10.0	0.0	16.7	1.7	15.0
41S	0.0	10.0	10.7	20.7	5.7	15.0
42C	0.0	10.0	2.0	12.0	1.0	11.0
43S	0.0	10.0	0.0	10.0	0.0	10.0
44S	0.0	10.0	0.0	10.0	0.0	10.0
45S	0.0	10.0	0.0	10.0	0.0	10.0
46S	0.0	10.0	1.0	11.0	0.3	10.7
47S	0.0	10.0	0.0	10.0	0.0	10.0
48C	0.0	10.0	1.8	11.8	0.5	11.3
49S	0.0	10.0	0.6	10.6	0.3	10.3
50S	0.0	10.0	0.0	10.0	0.0	10.0
51S	0.0	10.0	0.9	10.9	0.5	10.5
52S	0.0	10.0	0.9	10.9	0.2	10.7
55C	0.0	10.0	1.1	11.1	0.5	10.5
56C	0.0	10.0	5.1	15.1	1.0	14.1
57C	0.0	10.0	4.3	14.3	0.6	13.7
58S	0.0	10.0	0.0	10.0	0.0	10.0
59C	0.0	10.0	0.0	10.0	0.0	10.0
60C	0.0	10.0	0.0	10.0	0.0	10.0
61S	0.0	10.0	0.5	10.5	0.2	10.2
62S	0.0	10.0	0.0	10.0	0.0	10.0
64C	3.3	10.0	0.0	13.3	0.0	13.3

A	B	C	D	E	F	G
Unit	**Existing Percent Detrimental Disturbance**	**Projected Percent Detrimental Disturbance with Proposed Action[b]**	**Percent Detrimental Disturbance Associated with Haul Routes on Non-System Roads**	**Total Percent Projected Detrimental Disturbance**	**Percent of Unit Restored Due to Temporary Road Obliteration and Subsoiling[c,d]**	**Net Percent DSD After Proposed Action and Restoration**
65C	0.0	10.0	0.0	10.0	0.0	10.0
65ST	3.3	10.0	0.0	13.3	0.0	13.3
66C	0.0	10.0	0.4	10.4	0.0	10.4
67C	0.0	10.0	0.0	10.0	0.0	10.0
68C[a]	0.0	10.0	0.8	10.8	0.4	10.4
69S	0.0	10.0	0.0	10.0	0.0	10.0
71C	0.0	10.0	1.0	11.0	0.5	10.5
72S	0.0	10.0	1.0	11.0	0.5	10.5
73S	0.0	10.0	1.9	11.9	1.0	10.9
74S[a]	0.0	10.0	0.0	10.0	0.0	10.0
76S	0.0	10.0	0.0	10.0	0.0	10.0
77S	0.0	10.0	1.6	11.6	0.8	10.8
78S	0.0	10.0	1.4	11.4	0.7	10.7
79S	0.0	10.0	1.6	11.6	0.8	10.8
80C	0.0	10.0	1.2	11.2	0.0	11.2
81C	0.0	10.0	0.0	10.0	0.0	10.0

[a] No field data available for unit. Existing DSD assumed to be zero until field data collected.
[b] Assumes summer harvest for all units.
[c] Assumes 50 percent effectiveness from temporary road obliteration.
[d] Assumes 50 percent effectiveness from subsoiling.

Implementation of the proposed action creates the potential for three harvest units (51 acres or 2 percent of the proposed harvest acres) to exceed R1 Soil Quality Standards of 15 percent detrimental soil disturbance per activity area (table 71).

Subsoiling would occur on the following units to ensure compliance with the soil quality standards: 32ST (18.6% DSD), 40S (16.7 percent DSD), and 41S (20.7 percent DSD). The number of acres to be treated would vary by unit depending on unit size and projected DSD (table 72).

Table 72. Alternative 2 - Harvest units requiring restoration activities to ensure compliance of SQS

A	B	C	D	E	F	G
Unit	**Acres**	**Existing DSD (Acres)**	**Potential Acres To Restore (From New Disturbance)**	**Acres Requiring Restoration Treatment(S)[a]**	**Percent of Unit Restored Due to Subsoiling**	**Suitable Acres Available to Meet SQS Post Restoration [B]**
32ST	18	1.6	1.8	1.3	3.7	YES
40S	29	1.9	2.9	1.0	1.7	YES
41S	4	0.0	0.4	0.3	3.6	YES
		Total acres requiring restoration		**2.6**		

[a] Assumes 50 percent effectiveness for restoration treatments (acres requiring treatment have been doubled).
[b] Suitable acres available when Column D > Column E.

Units 32ST, 40S, and 41S would contain enough potential suitable acres for restoration treatments to ensure that R1 SQS would be met post restoration. Unsuitable acres would include areas of existing disturbance with impacts from livestock or mining, and inoperable ground such as rock outcrops and wet areas.

Prescribed Burning

Potential direct environmental effects of the prescribed burn component of the proposed action (eight prescribed burn units and post-harvest burning in commercial thin and seed tree units) are soil heating and loss of surface cover due to burning. The potential for detrimental soil heating is low given that the burning would occur in the spring or fall when soil moisture content is high. Spring burning is preferable when the potential for long duration, high intensity burns is lower due to higher fuel moisture levels. However, fall burning is also acceptable and the potential for soil heating is minimal if the prescribed burn is implemented within proper prescription parameters and mitigation measures are followed. Monitoring of the McVey and Doolittle prescribed burns on the Beaverhead-Deerlodge National Forest indicates that prescribed burning implemented in the spring resulted in an overall low soil burn severity (Fletcher 2011b). The surface organic layers are not completely consumed and are still recognizable in areas of low soil burn severity; therefore, the potential for detrimental soil disturbance due to loss of surface cover (i.e. organic matter) is low. Detrimental soil disturbance due to soil heating or loss of surface cover is not expected in any of the prescribed burn units.

Indirect Effects

Commercial Timber Harvest

Ground disturbing activities associated with the commercial timber harvest component of the proposed action have the potential to expose mineral soil to overland flow and subsequent erosion. Probability of erosion and estimated erosion rates was modeled for alternative 2 using Disturbed WEPP (assumptions listed above in the methodology section). The probability of erosion reflects the occurrence of erosion only for the year following harvest. Generally, for all harvest units, the probability of erosion would decline every year following harvest due to natural vegetative regeneration.

The probability of erosion increases in one unit, 73S, from 0 percent to 2 percent. However, model results for the proposed action - alternative 2 indicate an average annual erosion rate of 0 tons/acre/year for each modeled harvest unit.

The Region 1 SQS state that the tolerable soil loss rate (average annual) is generally less than 1 to 2 tons per acre per year (USDA Forest Service 1999). Based on the WEPP modeling, SQS for surface erosion would continue to be met in all units under the proposed activities for alternative 2. Additionally, the WEPP results do not take into account SWCPs listed in the Soil Resources project design features and mitigation measures, chapter 2; in particular, providing drainage control and slash placement on skid trails. These SWCPs will ameliorate disturbance associated with harvest, reduce erosion potential, and hasten soil recovery.

Ground disturbing activities associated with the commercial timber harvest component of the proposed action have the potential to spread invasive plant species into new, previously uninfested areas. The potential areas of invasive plant species spread would be on soils disturbed by temporary road and skid trail construction and landings. Based on a 2011 inventory, Canada thistle, common tansy, houndstongue, musk thistle, oxeye daisy, spotted knapweed, and yellow toadflax are present in the Flint Foothills project area mostly in rangeland and along roads; however, occurrences were noted in harvest units 1ST, 5ST, 6C, 19S, 20C, 22C, 24C, 25C, 27ST, 31C, 66C, 50S, 61S, and 79S (Rasor 2012). These weed species have the potential to affect soil productivity through competition for resources such as space, light, water, and nutrients; and also through allelopathy. Allelopathy is defined as “chemical interactions among and between plants that do not include positive effects” (Foy and Inderjit 2001). Allelopathic invasive plant species exude chemicals that can have a negative effect on native plant species. Canada thistle and spotted knapweed are known to be allelopathic (Foy and Inderjit 2001).

While the potential for impacts to soil productivity exists as a result of invasive plant species infestation, the actual impact to long term soil productivity is likely minimal, due to the following:

- The Invasive Plant Species section describes a low risk of noxious weeds becoming established and/or spreading in proposed treatment units within the project area.
- The mitigation measures listed in chapter 2 include monitoring and treatment for invasive plant species within units and along roads.
- Treatment of invasive plant species with herbicides on the Beaverhead-Deerlodge NF has been effective (infested acres reduced by 48 percent over the last 10 years on the Pintler Ranger District) (Rasor 2012).

Prescribed Burn

Potential indirect environmental effects of the prescribed burn component from the proposed action are potential accelerated erosion as a result of loss of surface cover due to burning, and loss of soil productivity due to invasive plant species spread. Surface cover is an important attribute in determining susceptibility to erosion. Work in burned forest soils by Noble (1965) and Orr (1970), as cited in Robichaud and others (2000), found that 30 percent cover reduces erosion by half compared to bare soil and 60 percent cover reduced sediment movement to negligible amounts. Monitoring of the McVey and Doolittle prescribed burns on the Beaverhead-Deerlodge indicate post burn surface cover ranging from 96-100 percent. The potential for accelerated erosion as a result of loss of surface cover due to implementation of the proposed action is low as surface cover post burn is expected to be more than adequate.

The potential for increasing the density and spread of invasive plant species, and in turn negatively affecting soil productivity is low. Project design features and mitigation measures for invasive plants (chapter 2) would lead to low risk of increasing the spread and density of invasive plant species.

Cumulative Effects

The cumulative impact of past disturbance in addition to proposed harvest activities and prescribed burn treatments under alternative 2 would not likely lead to long-term impairment of soil productivity, since the Region 1 SQS would be met. Cumulative impacts may be greatest where ground vegetation and ground cover is disturbed. Cumulative effects due to the proposed action activities and continued grazing are possible; however, additional cumulative effects from cattle activity following harvest are not expected because (1) no increases in cattle numbers or lengthening of the season of use would occur with implementation of the proposed action, (2) trailing through the unit would likely use existing cattle/game trails, and (3) allotments will be monitored for compliance with established grazing standards. Any cumulative effects due to cattle activity and proposed harvest that may occur in units would generally be limited to cattle trails and comprise a very small amount of disturbance.

Cumulative effects due to the proposed commercial timber harvest under alternative 2 and previous harvest activity was projected to exceed SQS in three harvest units (32ST, 40Sand 41S). These figures do not take into account the fact that some of the existing disturbance in the harvest units due to old skid trails and landings would probably be reused instead of creating additional DSD by constructing new skid trails and landings. These units would need to be monitored to ensure that SQS are met at the conclusion of the project. After project implementation, any harvest unit that does not meet standards would be restored to ensure that 85 percent of the harvest unit is in satisfactory soil condition; this would assure that productivity effects are reduced in the near term and eliminated over the long term.

Cumulative effects due to recreation would be limited to areas where proposed harvest units are also used for recreational activities. Effects from firewood gathering are generally limited to a 50 to 100-foot corridor from existing roads where firewood cutting activity has occurred. These effects are localized and generally minor. No dispersed camping sites were noted within the proposed harvest units, and obliteration of temporary roads would prevent unauthorized motorized access. Therefore, no cumulative effects from recreational activities would be expected.

Roadside Hazard Removal #4 is currently ongoing. This project involves removing dead and dying lodgepole pine along main roads within the project area. The corridor of tree removal varies, depending on the slope and height of the trees, from 0 to about 150 feet along both sides of the roadways. Trees will be whole-tree yarded to landing areas. Slash will either be burned on site, or chipped and removed. Some of the areas harvested under Roadside Hazard Removal #4 are adjacent to harvest units under the Flint Foothills proposed action. Cumulative effects, if they occur, would be limited to any skid trails used for the Flint Foothills units that also pass through the Roadside Salvage Units.

The cumulative effects of the proposed harvest and temporary road construction in addition to existing effects from previous harvest and grazing are shown in table 72, column E. This column displays the effects before restoration measures are applied. In three harvest units a restoration plan has been developed to assure compliance with the soil quality standards. The cumulative effects of existing detrimental soil disturbance, DSD created by this project, and

restoration of DSD is shown in table 72, column G. All units would meet the regional SQS. Monitoring would occur to ensure SQS are met.

Summary of Effects

Three harvest units (out of 65) are projected to exceed Region 1 SQS due to indirect, direct, and cumulative effects from the proposed action. However, with the identified project design features and mitigation measures, specifically restoration activities, all harvest units would meet the Region 1 SQS requiring that new activities do not create detrimental soil conditions on more than 15 percent of an activity area following project implementation and restoration activities, or in areas where more than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration should not exceed the conditions prior to the planned activity.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 2 would meet the standards to protect soil productivity set forth in the Region 1 Soil Quality Standards (USDA Forest Service 1999) and referenced in the Beaverhead-Deerlodge Forest Plan (USDA Forest Service 2009c).

- No ground based yarding would occur on slopes greater than 35 percent that have not had a site-specific analysis showing that damage is unlikely.
- Alternative 2 would result in at least 85 percent of each activity area having soil that is in satisfactory condition after any needed restoration measures are applied.
- Mitigation measures used are shown to be effective

Alternative 3

Direct Effects

Commercial Timber Harvest

Table 73 displays the potential direct environmental effects of the commercial timber harvest component of the proposed action on soil productivity including compaction, displacement, and rutting from machinery use during felling, bunching, skidding, processing and loading logs, and soil heating from slash and understory burning. These soils are resistant to compaction and rutting when soils are dry or frozen. Projected detrimental disturbance for each proposed harvest unit was determined as described in the methodology section above.

Haul routes include 2.3 miles of existing open and closed unauthorized routes. No proposed temporary roads would be constructed in alternative 3 (new construction). Temporary roads on existing open or closed unauthorized routes would be decommissioned (table 6)

Table 73. Alternative 3 - Projected detrimental soil disturbance by harvest unit

A	B	C	D	E	F	G
Unit	**Existing Percent Detrimental Disturbance**	**Projected Percent Detrimental Disturbance with Proposed Action[b]**	**Percent Detrimental Disturbance Associated with Haul Routes on Non-System Roads**	**Total Percent Projected Detrimental Disturbance**	**Percent of Unit Restored due to Subsoiling[c]**	**Net Percent DSD after Proposed Action and Restoration**
1ST	0.0	10.0	0.4	10.4	0.0	10.4
5ST	0.0	10.0	0.0	10.0	0.0	10.0
6C	0.0	10.0	0.0	10.0	0.0	10.0
8C	0.0	10.0	0.0	10.0	0.0	10.0
10C	0.0	10.0	0.0	10.0	0.0	10.0
11C	0.0	10.0	0.0	10.0	0.0	10.0
12C	0.0	10.0	0.2	10.2	0.0	10.2
16S	0.0	10.0	0.0	10.0	0.0	10.0
19S	0.0	10.0	0.0	10.0	0.0	10.0
20C	0.0	10.0	0.0	10.0	0.0	10.0
22C	0.0	10.0	0.0	10.0	0.0	10.0
23C	0.0	10.0	5.4	15.4	0.4	15.0
24C	0.0	10.0	0.0	10.0	0.0	10.0
25C	3.3	10.0	0.0	13.3	0.0	13.3
26S	0.0	10.0	0.0	10.0	0.0	10.0
27ST[a]	0.0	10.0	0.0	10.0	0.0	10.0
28C[a]	0.0	10.0	0.0	10.0	0.0	10.0
29C	0.0	10.0	0.0	10.0	0.0	10.0
30ST	0.0	10.0	0.0	10.0	0.0	10.0
31C[a]	0.0	10.0	0.0	10.0	0.0	10.0
32ST	8.7	10.0	0.0	18.7	3.7	15.0
33C	0.0	10.0	0.0	10.0	0.0	10.0
34S	0.0	10.0	0.0	10.0	0.0	10.0
35S	0.0	10.0	0.0	10.0	0.0	10.0
37S	0.0	10.0	0.0	10.0	0.0	10.0
39S	0.0	10.0	0.0	10.0	0.0	10.0
40S	6.7	10.0	0.0	16.7	1.7	15.0
41S	0.0	10.0	0.0	10.0	0.0	10.0
42C	0.0	10.0	0.0	10.0	0.0	10.0
43S	0.0	10.0	0.0	10.0	0.0	10.0
44S	0.0	10.0	0.0	10.0	0.0	10.0
45S	0.0	10.0	0.0	10.0	0.0	10.0
46S	0.0	10.0	0.0	10.0	0.0	10.0

A	B	C	D	E	F	G
Unit	**Existing Percent Detrimental Disturbance**	**Projected Percent Detrimental Disturbance with Proposed Action[b]**	**Percent Detrimental Disturbance Associated with Haul Routes on Non-System Roads**	**Total Percent Projected Detrimental Disturbance**	**Percent of Unit Restored due to Subsoiling[c]**	**Net Percent DSD after Proposed Action and Restoration**
49S	0.0	10.0	0.0	10.0	0.0	10.0
50S	0.0	10.0	0.0	10.0	0.0	10.0
51S	0.0	10.0	0.0	10.0	0.0	10.0
52S	0.0	10.0	0.4	10.4	0.0	10.4
55C	0.0	10.0	0.0	10.0	0.0	10.0
58S	0.0	10.0	0.0	10.0	0.0	10.0
59C	0.0	10.0	0.0	10.0	0.0	10.0
60C	0.0	10.0	0.0	10.0	0.0	10.0
61S	0.0	10.0	0.0	10.0	0.0	10.0
62S	0.0	10.0	0.0	10.0	0.0	10.0
64C	3.3	10.0	0.0	13.3	0.0	13.3
65C	0.0	10.0	0.0	10.0	0.0	10.0
65ST	3.3	10.0	0.0	13.3	0.0	13.3
66C	0.0	10.0	0.4	10.4	0.0	10.4
67C	0.0	10.0	0.0	10.0	0.0	10.0
69S	0.0	10.0	0.0	10.0	0.0	10.0
71C	0.0	10.0	1.0	11.0	0.0	11.0
73S	0.0	10.0	0.0	10.0	0.0	10.0
74S[a]	0.0	10.0	0.0	10.0	0.0	10.0
76S	0.0	10.0	0.4	10.4	0.0	10.4
79S	0.0	10.0	1.2	11.2	0.0	11.2
80C	0.0	10.0	0.0	10.0	0.0	10.0
81C	0.0	10.0	0.0	10.0	0.0	10.0

[a] No field data available for unit. Existing DSD assumed to be zero until field data collected.
[b] Assumes summer harvest for all units [c] Assumes 50 percent effectiveness from temporary road obliteration
[d] Assumes 50 percent effectiveness from subsoiling

Implementation of alternative 3 would create the potential for three harvest units (80 acres or 4 percent of the proposed harvest acres) to exceed R1 Soil Quality Standards of 15 percent detrimental soil disturbance per activity area (table 73). Sub-soiling would occur on the following units to ensure compliance with the soil quality standards: 23C (15.4 percent DSD), 32ST (18.7 percent DSD) and 40S (16.7 percent DSD). The number of acres to be treated would vary by unit depending on unit size and projected DSD (table 74).

Table 74. Alternative 3 - Harvest units requiring restoration activities to ensure compliance of SQS

A	B	C	D	E	F	G
Unit	**Acres**	**Existing DSD (Acres)**	**Potential Acres to restore (From New Disturbance)**	**Acres Requiring Restoration Treatment(S)[a]**	**Percent of Unit Restored Due to Subsoiling**	**Suitable Acres Available to Meet SQS Post Restoration [b]**
23C	33	0	3.3	0.3	0.4	YES
32ST	18	1.6	1.8	1.3	3.7	YES
40S	29	1.9	2.9	1.0	1.7	YES
		Total acres requiring treatment		**2.6**		

[a] Assumes 50 percent effectiveness for restoration treatments (acres requiring treatment have been doubled)
[b] Suitable acres available when Column D > Column E

Units 23C, 32ST and 40S would contain enough potential suitable acres for restoration treatments to ensure that R1 SQS would be met post restoration. Unsuitable acres would include areas of existing disturbance with impacts from livestock or mining, and inoperable ground such as rock outcrops and wet areas.

Prescribed Burning

Potential direct environmental effects of the prescribed burn component of the proposed action (eight prescribed burn units and post-harvest burning in commercial thin and seed tree units) are soil heating and loss of surface cover due to burning. The potential for detrimental soil heating is low given that the burning would occur in the spring or fall when soil moisture content is high. Spring burning is preferable when the potential for long-duration, high-intensity burns is lower due to higher fuel moisture levels. However, fall burning is also acceptable and the potential for soil heating is minimal if the prescribed burn is implemented within proper prescription parameters and mitigation measures are followed. Monitoring of the McVey and Doolittle prescribed burns on the Beaverhead-Deerlodge National Forest indicates that prescribed burning implemented in the spring resulted in an overall low soil burn severity (Fletcher 2011). The surface organic layers are not completely consumed and are still recognizable in areas of low soil burn severity; therefore, the potential for detrimental soil disturbance due to loss of surface cover (i.e. organic matter) would be low. Detrimental soil disturbance due to soil heating and/or loss of surface cover is not expected in any of the prescribed burn units.

Indirect Effects

Commercial Timber Harvest

Ground disturbing activities associated with the commercial timber harvest component of the proposed action would have the potential to expose mineral soil to overland flow and subsequent erosion. Probability of erosion and estimated erosion rates because of alternative 3 activities was modeled using Disturbed WEPP (assumptions listed above in the methodology section). The probability of erosion reflects the occurrence of erosion only for the year following harvest. Generally, for all harvest units, the probability of erosion would decline every year following harvest due to natural vegetative regeneration.

The probability of erosion increases in one unit, 73S, from 0 percent to 2 percent from the existing condition. However, model results for alternative 3 indicate an average annual erosion rate of 0 tons/acre/year for each modeled harvest unit.

The Region 1 SQS state that the tolerable soil loss rate (average annual) is generally less than 1 to 2 tons per acre per year (USDA Forest Service 1999). Based on the WEPP modeling, SQS for surface erosion would continue to be met in all units under the proposed action for alternative 3. Additionally, the WEPP results do not take into account SWCPs listed in the Soil Resources project design features and mitigation measures, chapter 2, in particular, providing drainage control and slash placement on skid trails. These SWCPs will ameliorate disturbance associated with harvest, reduce erosion potential, and hasten soil recovery.

Ground disturbing activities associated with the commercial timber harvest component of the proposed action have the potential to spread invasive plant species into new, previously uninfested areas. The potential areas of invasive plant species spread would be on soils disturbed by skid trail construction and landings. Based on a 2011 inventory, Canada thistle, common Tansy houndstongue, musk thistle, oxeye daisy, spotted knapweed, and yellow toadflax are present in the Flint Foothills project area mostly in rangeland and along roads; however, occurrences were noted in harvest units 1ST, 5ST, 6C, 19S, 20C, 22C, 24C, 25C, 27ST, 31C, 66C, 50S, 61S, and 79S (Rasor 2012). These weed species have the potential to affect soil productivity through competition for resources such as space, light, water, and nutrients; and also through allelopathy. Allelopathic weed species exude chemicals that can have a negative effect on native plant species. Canada thistle and spotted knapweed are known to be allelopathic (Foy and Inderjit 2001).

While the potential for impacts to soil productivity exists as a result of noxious weed infestation, the actual impact to long term soil productivity is likely minimal, due to the following:

- The Invasive Plant section describes low risk of invasive plant species becoming established and/or spreading in proposed treatment units within the analysis area.
- The mitigation measures listed in the DEIS include monitoring and treatment of invasive plant species within units and along roads.
- Treatment of invasive plant species with herbicides on the Beaverhead-Deerlodge NF has been effective (infested acres reduced by 49 percent on the Pintler Ranger District) (Rasor 2012).

Prescribed Burn

Potential indirect environmental effects of the prescribed burn component of the proposed action are potential accelerated erosion as a result of loss of surface cover due to burning and loss of soil productivity due to noxious weed spread. Surface cover is an important attribute in determining susceptibility to erosion. Work in burned forest soils by Noble (1965) and Orr (1970), as cited in Robichaud and others (2000), found that 30 percent cover reduces erosion by half compared to bare soil, and 60 percent cover reduced sediment movement to negligible amounts. Monitoring of the McVey and Doolittle prescribed burns on the Beaverhead-Deerlodge NF indicate post-burn surface cover ranging from 96 to100 percent. The potential for accelerated erosion as a result of loss of surface cover due to implementation of the proposed action is low as surface cover post burn is expected to be more than adequate.

The potential for increasing the density and spread of invasive plant species and in turn negatively affecting soil productivity is low. Project design features and mitigation measures described for invasive plant species (Chapter 2) lead to a low risk of increasing the spread and density of noxious weeds.

Cumulative Effects

The cumulative impact of past disturbance in addition to proposed harvest activities and prescribed burn treatments under alternative 3 would not likely lead to long-term impairment of soil productivity, since the Region 1 SQS would be met. Cumulative impacts may be greatest where ground vegetation and ground cover is disturbed. Cumulative effects due to the proposed action and continued grazing are possible. However, additional cumulative effects from cattle activity following harvest are not expected because (1) no increases in cattle numbers or lengthening of the season of use would occur with implementation of the proposed action, (2) trailing through the unit would likely use existing cattle/game trails, and (3) allotments will be monitored for compliance with established grazing standards. Any cumulative effects due to cattle activity and proposed harvest that may occur in units would generally be limited to cattle trails and comprise a very small amount of disturbance.

Cumulative effects due to the proposed commercial timber harvest under alternative 3 and previous harvest activity was projected to exceed SQS in three harvest units (23C, 32ST and 40S). These figures do not take into account the fact that some of the existing disturbance in the harvest units, due to old skid trails and landings, will probably be reused instead of creating additional DSD by constructing new skid trails and landings. These units will need to be monitored to ensure that SQS are met at the conclusion of the project. After project implementation, any harvest unit that does not meet standards will be restored to ensure that 85 percent of the harvest unit is in satisfactory condition; this will assure that productivity effects are reduced in the near term and eliminated over the long term.

Cumulative effects due to recreation would be limited to areas where proposed harvest units are also used for recreational activities. Effects from firewood gathering are generally limited to a 50 to100-foot corridor from existing roads where firewood cutting activity has occurred. These effects are localized and generally minor. No dispersed camping sites were noted within the proposed harvest units. Therefore, no cumulative effects from recreational activities would be expected.

Roadside Hazard Removal #4 is currently ongoing. This project involves removing dead and dying lodgepole pine along main roads within the project area. The corridor of tree removal varies, depending on the slope and height of the trees, from 0 to about 150 feet along both sides of the roadways. Trees will be whole-tree yarded to landing areas. Slash will either be burned on site, or chipped and removed. Some of the areas harvested under Roadside Hazard Removal #4 are adjacent to harvest units under the Flint Foothills proposed action. Cumulative effects, if they occur, would be limited to any skid trails used for the Flint Foothills units that also pass through the roadside salvage units.

The cumulative effects of the proposed harvest and temporary road construction in addition to existing effects from previous harvest and grazing are shown in table 73, column E. This column displays the effects before restoration measures are applied. In three harvest units a restoration plan has been developed to assure compliance with soil quality standards. The cumulative effects of existing detrimental soil disturbance, DSD created by this project, and

restoration of DSD is shown in table 73, column G. All units would meet regional SQS. Monitoring would occur to ensure SQS are met.

Summary of Effects

Three harvest units (out of 55) are projected to exceed Region 1 SQS due to indirect, direct, and cumulative effects from the proposed action. However, with the identified project design features and mitigation measures, specifically restoration activities, all harvest units would meet the Region 1 SQS requiring that new activities do not create detrimental soil conditions on more than 15 percent of an activity area following project implementation and restoration activities, or in areas where more than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration should not exceed the conditions prior to the planned activity.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 3 would meet the standards to protect soil productivity set forth in the Region 1 Soil Quality Standards (USDA Forest Service 1999) and referenced in the Beaverhead-Deerlodge Forest Plan (USDA Forest Service 2009c).

- No ground based yarding would occur on slopes greater than 35 percent that have not had a site-specific analysis showing that damage is unlikely.
- Alternative 3 would result in at least 85 percent of each activity area having soil that is in satisfactory condition after any needed restoration measures are applied.
- Mitigation measures used are shown to be effective

Hydrology

Introduction

This report documents existing conditions and the analysis of potential environmental effects to hydrologic resources from the proposed Flint Foothills Project. Potential effects addressed consist of impacts to water quality, water quantity, channel stability, and wetlands and floodplains.

Overview of Issues Addressed

The public expressed concerns during scoping that permanent and temporary road construction could affect water quality. Alternative 3 was developed to exclude all new road construction. Specific issues relevant to the analysis and associated indicators and measures are discussed below.

Issues and Measurement Indicators

Issue - Water Quality

- Indicator - Change in sediment delivery
    - Measure - Consistency of the project with total maximum daily loads (TMDLs)
    - Measure - Changes in sediment delivery to streams based on WEPP Road model, and sedimentation risk from haul routes
    - Measure - Changes in sediment from harvest units from Disturbed WEPP

    - Measure - Miles of new National Forest System (NFS) or temporary road construction
    - Measure - Miles of new National Forest System or temporary roads within 300 feet of streams
    - Measure - New haul route stream crossings and sediment delivery at stream crossings
- Indicator - Change in stream temperatures
    - Measure - Roads and openings in Riparian Conservation Areas (RCAs)

Issue - Water Quantity and Channel Stability

- Indicator - Changes in water yield and peak flows resulting in channel changes
    - Measure - Harvested area by 6th field HUC
    - Measure - Water yield increase greater than 10 percent

Issue - Wetlands and floodplains

- Indicator - Changes in floodplain and wetland function
    - Measure - New stream crossings in floodplains
    - Measure - Protection of wetlands provided by RCAs and other project design features

Affected Environment

Existing Condition

This section discusses those resources that may potentially be affected by the proposed project. Also included are background data to provide context for later discussions of effects.

Watershed Description and Conditions

The project area totals 44,493 acres and is located within portions of the Barnes Creek, Clark Fork River-Dunkleberg Creek, Clark Fork River-Perkins Creek, Douglas Creek, Gold Creek, Lower Flint Creek-Gird Creek and Pikes Peak Gulch 6th level watersheds, or HUC(Hydrologic Unit Code). The Hydrologic Unit system is a standardized watershed classification system developed by U.S. Geological Survey (USGS) in the mid-1970s. Hydrologic units are watershed boundaries organized in a nested hierarchy by size. They range in size from regions to the smaller cataloging units (HUCs), which are roughly equivalent to local watersheds.

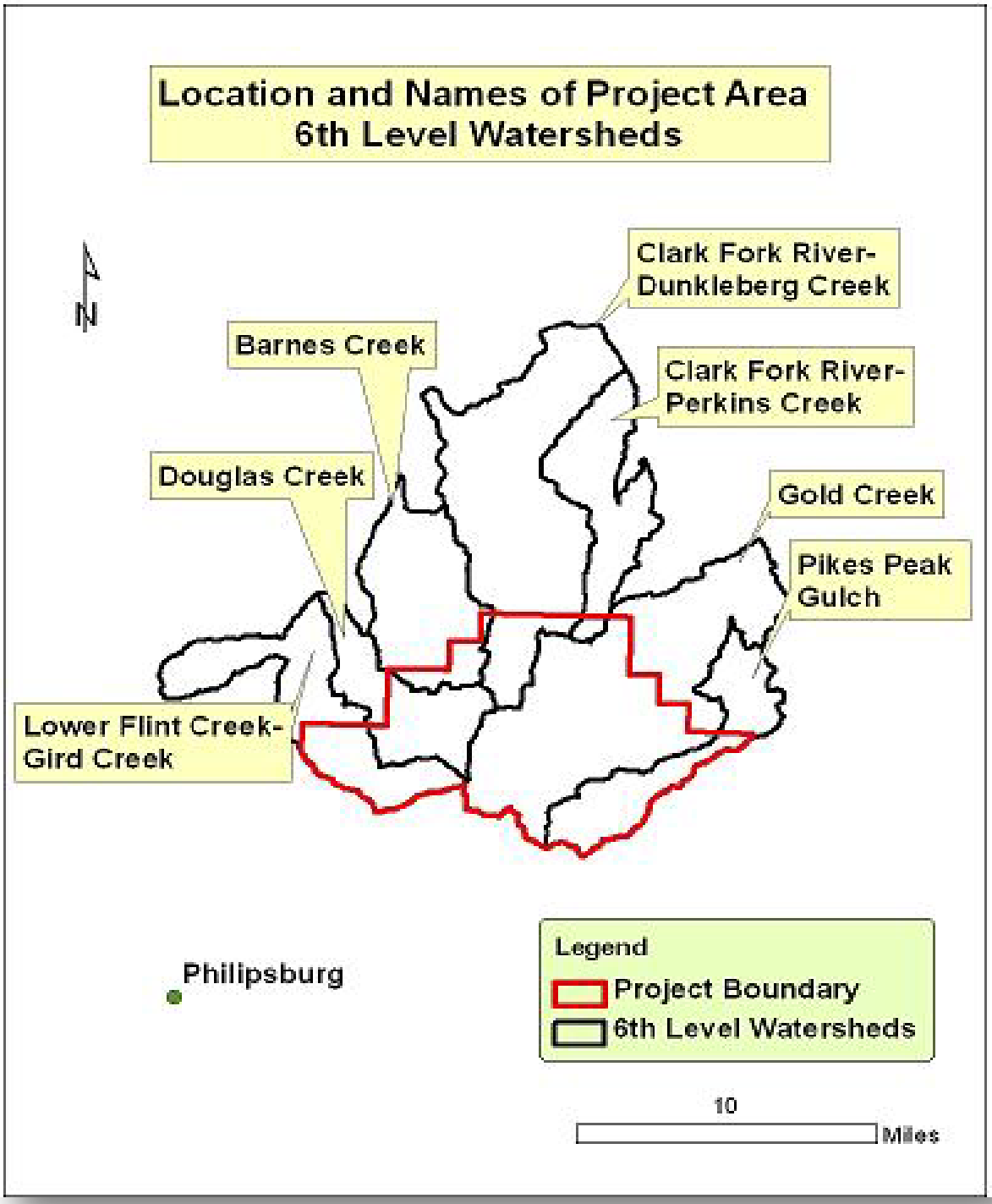


Figure 39. Location and names of 6th level watersheds in the Flint Foothills area

Past management activities with the project area that have affected watershed conditions include placer and lode mining, livestock grazing, timber harvest, prescribed fire treatments, and road construction and maintenance. Mining has had detrimental effects on channels in some areas, with excessive sedimentation leading to over-widened channels, such as seen in lower Douglas Creek. Ongoing impacts from existing and past impacts from abandoned mines could include ground disturbance, sediment from access roads, and minor forest clearing. Past impacts to water quality in mining areas in the project area have been documented in several drainages and include heavy metal contamination in streams. Abandoned mine sites may continue to be a source of water quality impairment.

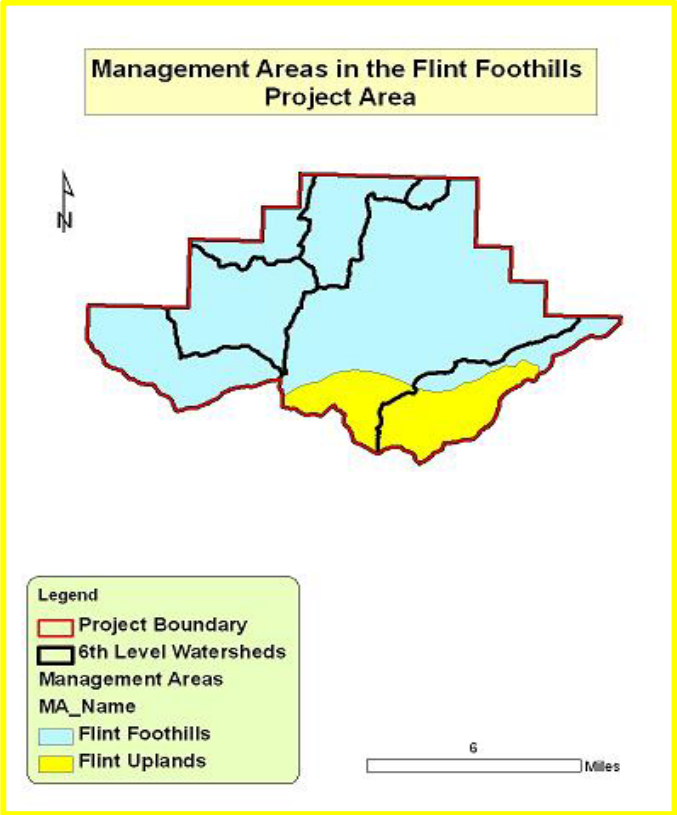


Figure 40. Management areas and 6th level watersheds in the Flint Foothills project area

Grazing can also impact streams, because cattle often congregate along streams and within riparian areas. Watershed conditions were surveyed as part of this project, and within these grazing allotments conditions appeared to be generally good. Although none were observed, there are likely localized areas where riparian areas are somewhat degraded or stream banks are modified by trampling and compaction.

Past vegetation and prescribed burning treatments were numerous within the project area. The list of past treatments associated with ground disturbance is displayed in appendix D. The earliest recorded harvest treatments were completed between 1950 and 1959, with the most recent occurring in 2011. Douglas Creek watershed has the highest percentage of area involved in past vegetation treatments at 8.2 percent. Gold Creek, Lower Flint Creek-Gird Creek and Pikes Peak Gulch watersheds have 2.5, 4.1 and 1.5 percent of areas involved in past treatments, respectively. Barnes Creek, Clark Fork River-Dunkleberg Creek and Clark Fork River-Perkins Creek all have less than 1 percent of watershed areas involved with past vegetative treatments.

Currently, tree mortality in watersheds affected by mountain pine beetle ranges from 6 trees per acre at Gold Creek watershed, to up to 310 trees per acre for Lower Flint Creek-Gird Creek watershed. This has led to scattered mortality of overstory trees in some areas (Gump 2011). Currently, 100 percent of the lodgepole pine stands with trees greater than 5 inches diameter at breast height (d.b.h.) in the Flint Foothills watersheds have been affected by the mountain pine beetle, causing extensive tree mortality (Vegetation section).

Water Quality (Issue)

Total Maximum Daily Loads (TMDLs)

Water quality is defined by the level of impairment of designated beneficial uses for a given stream drainage. Designated beneficial uses are defined under Title 17, Chapter 30, and Subchapter 6: “Surface Water Quality Standards” in the Administrative Rules of Montana (ARM) (State of Montana, 2010a).

The waters within the proposed project boundary are classified as B-1 waters (State of Montana 2010a). Water classified B-1 is suitable for drinking, culinary and food processing purposes, and after conventional treatment; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.

For all streams, the State of Montana requires that "land management activities refrain from generating pollutants in excess of those that are naturally occurring. Naturally occurring' is defined by the Administrative Rules of Montana as that water quality condition resulting from runoff or percolation over which man has no control or from developed lands where all 'reasonable' land, soil and water conservation practices have been applied." Compliance with Montana water quality law requires: (1) BMPs or project design features are applied, (2) Beneficial uses are not impaired, and (3) Monitoring takes place to test whether BMPs are protecting beneficial uses.

Streams found to be impaired—not fully meeting water quality standards or threatened—likely to violate standards in the near future—are compiled with the State’s water quality standards, which are listed every two years in the report required by Section 305(b) of the Clean Water Act. Impaired waters are often referred to as “water quality limited” (WQL) and are identified in the “303(d) list”.

The 2011 GIS layer for 303(d) streams in Montana indicates that there are 16.2 miles of water quality limited (WQL) streams within the project boundary including Barnes Creek, Dunkleberg Creek, North Fork Douglas and Douglas Creeks and Gold Creek. Table 75 describes what is limiting water quality for these streams. Note that impairments in Dunkelberg, NF Douglas and Gold Creeks are associated with heavy metals from mining or nutrients. Metals concentrations or nutrients in project streams will not be affected by this project and will not be addressed in the subsequent analysis.

Table 75. Summary of 303(d) listed streams in project area and beneficial uses not met by streams

303(d) Listed Stream	Reason Stream is Listed	Beneficial Use Not Met
Barnes Creek (headwaters to mouth (Flint Creek))	Sediment, Nutrients, Iron	Drinking Water Aquatic Life-Cold Water Fishery Primary Contact Recreation Industrial Agricultural
Dunkleberg Creek (Headwaters to T9N,R21W, S2 SW)	Heavy Metals, Nutrients	Drinking Water Aquatic Life-Cold Water Fishery Primary Contact Recreation
Douglas Creek (Confluence of Middle and South	Nutrients, Stream Substrate	Aquatic Life-Coldwater Fishery

303(d) Listed Stream	Reason Stream is Listed	Beneficial Use Not Met
Forks to mouth-Flint Creek/T9N,R13W, S10)		
North Fork Douglas Creek (Headwaters to mouth of Middle Fork Douglas Creek)	Heavy Metals	Drinking Water Aquatic Life- Cold Water Fishery Primary Contact Recreation Agricultural
Gold Creek (Headwaters to National Forest Boundary)	Heavy Metals, Nutrients, Low Flow Alterations	Drinking Water Aquatic Life-Coldwater Fishery

303(d) listed streams must be scheduled for development of water quality improvement strategies. These strategies are in the form of total maximum daily loads, or TMDLs intended to define the quantity of pollutants that may be delivered to a water body without violating water quality standards. In practice, they are plans to improve water quality in a listed water body until water quality standards are met (i.e., until designated uses are fully supported).

Currently there is a draft TMDL in place for the Flint Creek drainage. The Draft Flint Creek Planning Area Sediment and Metals TMDLs and Framework Water Quality Improvement Plan (Montana 2012) include target pollutant allocations for streams in the project area. Barnes Creek, a tributary to Flint Creek, is the only stream in the project area impaired for sediment (table 76). The sediment load allocation for Barnes Creek under the draft TMDL totals 461 tons/year, and allows for 1 ton of sediment to be delivered to the channel from all roads (table 76). This represents an estimate of the sediment expected to be delivered under all reasonable land, soil, and water conservation practices and natural conditions.

Table 76. Sediment TMDL load allocations for Barnes Creek

Barnes Creek Sediment TMDL Load Allocations			
Sediment Sources	**Current Estimated Load (Tons/Year)**	**Sediment Load Allocation (Tons/Year)**	**Sediment Load Allocation – Expressed as Percent Reduction**
Bank erosion	409	186	55%
Roads	3	1	79%
Upland load	635	275	57%
Total sediment load	**1,047**	**461**	**56%**

The road sediment allocation in the TMDL represents a gross estimate of the sediment load once road BMPs are applied. The TMDL assumes sedimentation from road treads, cutslopes, and fillslopes will be reduced to 100 feet on each side of a crossing, once BMPs are applied. This distance is not a formal goal at every crossing. For example, many roads may easily allow for a smaller contributing length, while others may not be able to meet a 100-foot goal. Achieving this reduction in sediment loading from roads may occur through a combination of methods.

Project Area Roads (Haul Routes) and Sediment

Existing roads within the analysis area provide the benefit of access for management activities

and public use including recreation, but can also have adverse impacts to the function of the watershed. Existing water quality concerns relevant to the Flint Foothills analysis are primarily the result from sediment delivered from roadways. Factors such as the condition of the road bed and its surface, its proximity to the stream, and the interconnectedness of the road drainage with the stream system can influence sediment delivery from area streams. Roads located along streams in RCAs can pose a higher risk of delivering sediment to streams because there is less travel distance to infiltrate drainage leaving the road or cut- and fill slope surface. Undersized culverts on roads in the project area, while not affecting current water quality, are also a concern in that culvert failure during a large flow event would likely result in the entrainment and deposition of large volumes of sediment within stream channels.

By intercepting subsurface water and routing it to the surface of the road, and through erosion of the road surface and ditch networks, roads can alter physical processes in streams, leading to changes in flow regimes, the movement and storage of sediment, bank stability and substrate composition. These changes can have important biological consequences, affecting all stream ecosystem components (Furniss et al. 1991). The changes also can range from subtle to dramatic, depending on a variety of factors, including the resilience of the watershed to disturbance, weather, traffic patterns, road surfacing material, condition of the road surfacing, condition of the road profile (maintenance), and the interconnectedness of the road drainage with the fluvial system.

Major fish bearing streams in the project area that may have been affected by existing road networks include Dunkleberg Creek, Douglas Creek, SF Douglas Creek, MF Douglas Creek, NF Douglas Creek, Gold Creek, NF Gold Creek, SF Gold Creek, Blum Creek, Crevice Creek, Pikes Peak Creek, and Gird Creek. Refer to figure 41 in the aquatics section for a map of these streams. Roads within each of the watersheds have to some degree contributed sediment to stream channels, and altered hillslope drainage patterns.

Field work in summer 2011 revealed a range of existing road conditions for potential haul routes. Roads in valley bottoms, roads paralleling streams and within 300 feet of a stream, and roads with live stream crossings generally pose the highest risk of contributing road-derived sediment. A road sediment survey was conducted for the project area watersheds to evaluate existing rates of sedimentation. The survey identified existing road segments that were hydrologically linked to stream channels, with a focus on areas where roads crossed streams, and thus had the potential to deliver sediment to channels during runoff events. These areas are summarized in detail in table 77. Observed problems with roads usually involved poor drainage and erosion of the road surface.

Road maintenance activities would include surface blading, vegetation removal, minor slump repair (5 cubic yards or less) and drainage structure cleaning, and installation. Reconstruction activities would include the previous items as well as more significant roadway realignment, embankment and slump repair over 5 cubic yards, curve widening, subgrade boulder or cobble excavation and removal, and upgrades to accommodate safe timber haul. Refer to figure 5 in chapter 2 for a map of the road system in the project area. Specific road maintenance and reconstruction activities for each road used as a haul route are identified in appendix A of the transportation report in the project file.

Existing Sedimentation from Roads: WEPP Roads

Road segments that are hydrologically linked to stream channels and thus have the potential to deliver sediment to channels during runoff events were identified in the sediment source survey. Existing road segments identified in the survey were modeled using the WEPP Roads model

(Elliot et al.1999). The model's output consists of predicted annual average sediment yield from the road prism, in terms of pounds per year, based on site-specific climate data and road characteristics. The model estimated an annual average sediment delivery to project streams under existing, current conditions. Results of modeling are presented in table 77.

The concept of an existing, current average annual sediment load is somewhat misleading in that sediment delivery varies widely from year to year based mainly on runoff variability. In WEPP, the average annual sediment load value is calculated based on a 2-year-return-interval runoff event—there is an equal probability that the sedimentation could be greater or less than this value.

Comprehensive sediment management begins by identifying the existing primary sources of sediment and developing a strategy that preferably minimizes or eliminates sources of sediment or the erosive action in the first place. This can be accomplished by first reviewing all existing road segments posing sediment delivery risk to the stream system, planning preventive measures that reduce or eliminate road-derived sediment, and then implementing those measures. Identification of major sediment delivery sources to streams on many roads in the Flint Foothills Project area have been identified in table 77.

Table 77. Summary of existing current road conditions and problem areas, with existing sediment yield estimated with Road WEPP at road/stream crossings

Road Number	Comments	Sediment (lbs./year)
5167	Pike Peak Ck drainage Rutted in spots, needs improved drainage to route water onto hillside, and needs surfacing all along steeper uphill section. **Not considered a sediment source to nearby streams**	-
636	Gold Ck Drainage Parallels an intermittent drainage Possible sediment source at stream crossings	117
636	Davidson Ck- Crossing to hillcrest. Gullies were observed in road surface. Road parallels Davidson Ck in places, sediment source at stream crossings	543
78473	Mostly good condition**, Not considered a sediment source.**	-
78472	78472 road adjacent to unit 16P had poor drainage. This is a naturally wet area and streamflow and sediment source area.	538
636 Rd South Fork Gold Creek Crossing near unit 45S	North side of channel has drainage problems, rutting down road.	186
NFS road 8615 into unit 8B	Intermittent drainage through unit is a sediment source to stream	26
Access road to units 40S, 39S off NFS road 636	Wet area along road needs drainage improvement- potential sediment source. Currently not a sediment source.	–
1557	Along Gold Creek, stable, no sediment source at stream crossing	-

Road Number	Comments	Sediment (lbs./year)
636	North Gold Creek Sediment source at stream crossing	123
1557	Crevice Ck- Possible undersized culvert and sediment source	387
1557 Rd, spur to Unit 16S, 64S, (8464 road)	Dunkleberg Creek- Very wet area and stream flow source areas- Road is overgrown, and culverts have been pulled- needs total re-build. Currently not a sediment source	-
1557 road Blum Ck area	Road through unit 11p has rutting problems from poor drainage. Crossing over an intermittent drainage within unit 11P needs surfacing. Currently not a sediment source.	-
NFS road 5151 into unit 64C	Needs surface blading in spots, especially within unit 64C. Roads are currently overgrown with grasses. Currently not a sediment source	-
NFS road 1557 near unit 10P	Rills in road, potential sediment source	403
Stream crossing nr. Rd 78461/636 Intersection Intermittent drainage	Potential sediment source, recommend slash windrows along fill downstream side, potential sed. source	438

*From WEPP Modeling

Sediment from Past Harvest

Vegetation has recovered in past harvest areas; outside of access roads, these areas were not observed to be active sediment sources.

Stream Temperatures

Stream temperatures have the potential to be affected from removal of trees adjacent to stream channels. Currently there are no documented concerns with stream temperatures for streams within the project area.

Water Quantity and Channel Stability (Issue)

Stream flows, or water quantity as it relates to effects on channels, is an important variable in the project area. Increased streamflows can change channel morphology, leading to channel and bank instability, stream sedimentation and water quality impairments. A review of the U.S. Geological Survey Water Information System Mapper indicates that there are no U.S. Geological Survey (U.S.G.S) stream gaging stations within the project area.

In the Pintler Range, flows generally peak in the spring due to snow melt and rain on snow events. Low base flows typically occur in the summer as temperatures increase and continue on into winter when temperatures decrease, and precipitation tends to occur as snowfall. Smaller peak flows may be observed in streams during the summer if convective thunderstorms occur and are associated with higher amounts of rainfall.

Past forest harvest in the project watersheds has not likely lead to measureable changes in stream flow amounts and total water yield in the project area because it was limited in extent to under 20 percent of each watershed**.** Peer-reviewed research has suggested that in areas such as the project area, roughly 20 to 30 percent of a watershed must be treated in order to begin to attain a statistically significant increase in streamflow (MacDonald and Stednick 2003). Hydrologic recovery is the process that takes place mainly as a result of vegetative re-growth where the flow or runoff patterns from watersheds return to pre-disturbance conditions after a disturbance such as forest harvest or beetle kill.

Past forest harvest in the project watersheds was limited to less than 10 percent of each watershed on National Forest System lands. Harvest has also occurred on private lands within the project area; when added to the percent watershed harvested amounts shown in table 6 the past harvest would not appreciably increase changes in percent watershed harvested values. Private lands total 7,512 acres within the project area. Currently, harvest on private inholdings has occurred on approximately 80 percent (about 5,500 acres) of the forested portions. Most of the harvest on private land took place in the 1980s. Not all of the inholdings are forested; about 10 percent are nonforested, dry grassland areas. Private land harvest would have to be extensively recently clearcut in order to increase percent harvest values to amounts needed to begin to see flow increases as a result of the project, and this level of harvest was not observed on private lands adjacent to the project area within the project watersheds.

Table 78 summarizes the percent of acres treated in the past for each of the 6th field watersheds. The highest value is Douglas Creek at 8.2 percent. Full vegetation recovery from re-growth of vegetation treatments is assumed at 30 years for stand clearcuts (Gump 2011). For the project area, past clearcut treatments are assumed to be fully recovered or almost fully recovered since many of these treatments took place in the 1980s and 1990s. Recent clearcuts, within the last ten years, have taken place in the project area, but they represent small acreage percentages, and do not appreciably affect watershed percent harvest. Some broadcast and underburning has occurred as part of past projects. Vegetative recovery for broadcast and underburning is considered 1 to 2 years (Gump 2011) and past impacts are considered to be recovered.

Table 78. Percent of each of 6th level watershed treated, 1959-2011, National Forest System lands.

6th level Watershed	Total Percent of Watershed Treated
Douglas Creek	8.2 percent
Lower Flint Creek-Gird Creek	4.1 percent
Gold Creek	2.5 percent
Pike Peaks Gulch	1.5 percent
Barnes Creek	Less than 1 percent
Clark-Fork Dunkelberg Creek	Less than 1 percent
Clark Fork River-Perkins Creek	Less than 1 percent

According to the Draft Flint Creek Planning Area Sediment and Metals TMDLs and Framework Water Quality Improvement Plan (Montana 2012) timber harvest should not increase the peak water yield by more than 10 percent of historic conditions. If a natural disturbance, such as a forest fire or beetle kill, increases peak water yield, the increase should be accounted for as part of timber harvest management.

Numerous studies have been done on water yield and streamflow changes after forest harvest. In a review and summary of the short-term effects of forest harvest in the United States and other countries, Hibbert (1967) concluded that a "reduction of forest cover increased water yield," but the "response to treatment is highly variable, and for the most part, unpredictable." He also found that, in general, the increases in streamflow and water yield decreased over time as vegetation re-grew. In a later review, Bosch and Hewlett (1982) analyzed an additional 55 studies and concluded that increased streamflow is caused by a decrease in forest cover, and that the decrease correlated with the amount of the forest overstory canopy removed. Streamflow increases were highest in areas with greater amounts of mean annual precipitation, and were generally short-lived as vegetation re-grew.

Observed changes in the water yield after forest removal in snowmelt-dominated areas in the intermountain west are due to both a decrease in winter interception and a reduction in growing season soil moisture depletion (Potts 1984; Troendle 1987). In the upper part of project subwatersheds, precipitation accumulates over the winter as snow pack, with minimal melt over this accumulation period. When the snowpack begins to melt in spring, the melt water first recharges the soil by replacing the water depleted during the previous growing season. Once soil moisture storage is filled, the excess meltwater is available to become streamflow. Paired watershed studies have shown that approximately 30 percent of the increase in water yield can be attributed to the decrease in interception and resultant increased amount of water contained in the snowpack. The reduced evapotranspiration during the previous summer also reduces the amount of meltwater needed for soil moisture recharge. This process accounts for approximately 50 percent of the increase in water yield. The remaining 20 percent of the observed increase in water yield results from the reduction in evapotranspiration losses during April and May (Troendle and King 1985).

Total water yield increase from project watersheds is not expected due to beetle killed trees. Beetle killed tree mortality in lodgepole pine and other species may have led to the reduction of overstory trees This may have led to slight increases in snowpack accumulation (up to 15 percent greater) in some areas, with slightly earlier snowmelt runoff (Pugh and Small 2011) by up to a week. Younger lodgepole pine trees less than 5 inches d.b.h. largely remain unaffected by insect mortality. As trees lose their needles, slight increases in water availability may occur due to lower amounts of evapotranspiration compared to a fully forested condition. These increases may be offset, however, by existing understory vegetation that is released by overstory mortality.

Riparian Areas and Riparian Conservation Areas

GIS data on riparian areas within the project area and the forest is limited. There is a "modeled" riparian GIS layer. In this layer the presence of riparian vegetation is projected based on slope, aspect, and the use of Digital Elevation Model (DEMs) and a portion of the National Wetlands Inventory (NWI) wetlands layer.

Riparian Conservation Areas (RCAs) are the portions of watersheds where riparian-dependent resources receive primary emphasis. RCA definitions, goals, objectives and standards are defined in the Forest Plan. In RCAs, management activities are subject to specific standards and guidelines. The Forest Plan (p. 300) defines RCAs as, "300 feet from perennial streams and 50 feet from intermittent streams" (USDA Forest Service 2009). There are many acres of intermittent and perennial RCAs in the project watersheds. These areas act as filters to appreciably reduce the risk of sediment delivery to streams, provide a source of large woody debris for channels, and help maintain cooler stream temperatures.

Wetlands and Floodplains (Issue)

Wetlands

No wetlands or springs were observed within proposed project units. Springs and seeps were observed throughout the project area. Usually springs and seeps are associated with headwater areas of streams. National Forest System road 636 between South and North Gold creeks has a high density of springs. This is a north aspect slope. These springs are an issue because of the need to maintain the NFS 636 Road as a haul road for the project. The National Wetlands Inventory (NWI) database helped to determine the presence of wetlands within the project area. This data is summarized in the hydrology report in the project file.

Floodplains

A floodplain is flat or nearly flat land adjacent to a stream or river that experiences occasional or periodic flooding. It includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows, and the flood fringe, which are areas covered by the flood, but do not experience a strong current (http://en.wikipedia.org/wiki/Floodplain). Narrow floodplains exist along stream channels in the project area.

Desired Condition

Forest Plan

Forest Plan direction for hydrologic resources that are applicable to this project are listed below.

Forestwide Goals for Aquatic Resources

Watersheds: Watersheds are maintained to ensure water quality, timing of runoff, and water yields necessary for functioning riparian, aquatic ecosystems, wetlands, and to support native aquatic species reproduction and survival. Watershed restoration projects promote long-term ecological integrity of ecosystems, conserve genetic integrity of native species, and contribute to attainment of desired stream function and support beneficial uses (IN 1).

Total Maximum Daily Loads (TMDLs): Management actions are consistent with TMDLs. Where waters are listed as impaired and TMDLs and Water Quality Restoration Plans are not yet established, management actions do not further degrade waters. Water quality restoration supports beneficial uses.

Stream Channels: Stream channel attributes and processes are maintained and restored to sustain natural desired riparian, wetland, and aquatic habitats and keep sediment regimes as close as possible to those with which riparian and aquatic ecosystems developed (IN 2).

Instream Flows: Instream flows are secured to support functioning riparian and aquatic habitats, stable and effective stream function, and ability to route flood discharges (IN 3).

Floodplains: The condition of floodplains, channels and water tables are maintained and restored to dissipate floods and sustain the natural timing and variability of water levels in riparian, wetland, meadow and aquatic habitats (IN 4).

Riparian Areas: Riparian habitat, species composition, and structural diversity of native and desired nonnative riparian plant communities are maintained or restored to (IN 5-6):

- Provide an amount and distribution of woody debris characteristic of functioning aquatic and riparian ecosystems
- Provide adequate summer and winter thermal regulation for streams to support beneficial uses
- Provide bank stability to maintain rates of surface erosion, bank erosion, and channel migration which are characteristic of functioning aquatic and riparian ecosystems
- Effectively trap and store sediment, build stream banks and floodplains, and promote recovery after watershed disturbance

Riparian Habitat: Habitat to support viable, well-distributed populations of native and desired nonnative plant, invertebrate, and vertebrate aquatic- and riparian-dependent species are maintained or restored. Movement corridors within and between watersheds, where desired, are maintained or restored to provide aquatic-dependent species' habitat needs and maintenance of metapopulations (IN 8).

Riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within the specific geo-climatic region are maintained or restored (IN 7).

Channel Integrity: Stream channel function and water quality are maintained or restored to support designated beneficial uses on all reaches through management decisions, restoration projects or best management practices as outlined in the Soil & Water Conservation Practices Handbook(1988).

Roads: Roads are designed, constructed, and maintained to meet desired stream function and avoid adverse effects to native fish and sensitive aquatic species (RF 2).

Stream Crossings: Culverts, bridges, and other stream crossings can accommodate a 100-year flood, including associated bedload and debris (RF 4).

Forestwide Objectives

TMDLs: Cooperate with the state, tribal, and other agencies and organizations to develop and implement total maximum daily loads (TMDLs) and their implementation plans for 303(d) impaired water bodies influenced by National Forest System lands.

Road Drainage: Reconstruct road and drainage features that do not meet design criteria or operation and maintenance standards, or are proven less effective for controlling sediment delivery, or retard attainment of desired stream function, or increase sedimentation in Fish or Restoration Key Watersheds (RF 3a).

Roads: Close and stabilize or obliterate and stabilize roads not needed for future management activities (RF 3c).

Forestwide Standards

Standard 1: Riparian Conservation Area (RCA) -1 Any activity in RCAs shall be designed to enhance, restore, or maintain the physical and biological characteristics of the RCA by implementing the following requirements.

> Activities in RCAs, that meet or exceed RMOs, must be designed to maintain existing stream function.

Activities in RCAs that are not meeting RMOs shall include a restoration component, commensurate with the scope of the activity affecting the fishery, which trends towards accomplishing desired stream function, as part of the project.

Activities in RCAs shall not result in long-term degradation to aquatic conditions. Limited short-term effects from activities in the RCA may be acceptable when outweighed by the long-term benefits to the RCA and aquatic resources.

Standard 25: Project related storage of fuels and toxicants within Riparian Conservation Areas is prohibited. Refueling within Riparian Conservation Areas is prohibited except for emergency situations, in which case refueling sites must have an approved spill containment plan (RA-4).

Existing Laws, Regulations, Executive Orders and Memorandum of Understanding

Federal Laws and Executive Orders Relating to Water Quality

Federal laws that govern federal actions with potential to affect water quality and quantity include the Clean Water Act, the Organic Act of 1897, the Multiple Use-Sustained Yield Act, the National Environmental Policy Act, the Forest and Rangeland Renewable Resources Act and the National Forest Management Act.

Executive Order 11988, Floodplain Management

This Executive Order requires that agencies avoid, to the extent possible, adverse impacts associated with occupancy and modification of floodplains. It applies to all floodplain locations, as a minimum to areas in the 100-year, or base, floodplain.

Executive Order 11990, Protection of Wetlands

This Executive Order states that agencies shall minimize destruction, loss, or degradation of wetlands and shall preserve and enhance their natural and beneficial values. Agencies are to avoid construction in wetlands unless it is determined that there is no practicable alternative and that all practicable measures are taken to minimize harm to wetlands

Montana Laws and MOU Relating to Water Quality and Quantity

The following Montana Code Title 75: Environmental Protection, Chapter Five: Water Quality (http://data.opi.mt.gov/bills/mca_toc/75_5_1.htm) and Montana Administrative Rules of the State of Montana (ARM).

Memorandum of Understanding

Montana ARM 16.20.603 states that there is a Memorandum of Understanding (MOU) between the State of Montana and the Forest Service, which states that the Forest Service will use best management practices, or BMPs, to deal with preventing or mitigating non-point source pollution

Details from the Clean Water Act, the National Forest Management Act, and applicable State of Montana regulations are provided in the hydrology report in the project record.

Forest Service Manuals and Handbooks

Forest Service Manual, Water Resources Management, sections 2532.02, 2532.03

Sections 2532.02 and 2532.03 of the Manual describe the objectives and policies relevant to protection (and, where needed, improvement) of water quality on National Forest System lands so that designated beneficial uses are protected. Guidelines for data collection activities (inventory and monitoring) are also described.

Forest Service Handbook 2500

This handbook states policy and direction regarding watershed management.

Forest Service Handbook 2509.22 Soil and Water Conservation Handbook

Provides a non-point source management strategy to develop site-specific conservation practices for activities on national Forest System lands to minimize effects on soil and water resources and protect water-related beneficial uses.

Environmental Consequences

Methodology

Field work was conducted to assess stream channel flow characteristics (perennial, intermittent, or ephemeral), presence or absence of wetlands and overall watershed condition, and to examine these characteristics relative to the location of the proposed action. In addition to field data, best available science, literature reviews, Forest monitoring reports, geographical information system (GIS) data, and professional judgment were also used to support report conclusions.

Field reconnaissance for hydrologic resources was conducted in August 2011 to evaluate existing watershed conditions and the potential effects to these resources related to the proposed action. Proper functioning condition data was noted for several of the stream drainages that were visited. This information is provided in hydrology report in the project file.

The WEPP Road model was used to predict sediment transport from roads to stream channels. The Disturbed land WEPP model was also used to evaluate hillslope erosion (Soils section). Input data used to run these models were collected in the field during sediment surveys. The physical basis and performance of the WEPP models is discussed in the model documentation (Elliot et al. 1999, 2000) as well as several peer-reviewed papers (e.g. Larsen and MacDonald 2007; Laflen et al. 2004; Elliott 2004). In general, erosion prediction models have limited precision predicting sediment from a road, hillslope, or watershed at time scales useful to land managers. This is due mainly to a high degree of variability in site characteristics and in climatic variables. An average erosion/sediment delivery rate prediction can encompass this variability to some degree, although this value becomes much more useful when combined with a predicted probability that erosion will occur. The WEPP models incorporate climate data tailored to the individual site using PRISM data (Daly et al. 2001) and simulates daily events for a number of years specified by the user (30 years in this analysis) to determine the probability of sediment leaving the unit. The model incorporates individual precipitation event characteristics and antecedent conditions as well as site characteristics into its prediction of average annual runoff, erosion, and sediment yield values.

Spatial and Temporal Context for Effects Analysis

The spatial boundary for cumulative, direct and indirect effects is delineated by the 6th-level watersheds within the project boundary. The project boundary is an appropriate scale for determining potential effects. If larger scales were used for either direct, indirect or cumulative

effects, the amount of area involved would be too large compared to the project scale and effects would appear diminished.

Two levels of temporal context are discussed in the effects analysis. The time frame for short-term effects unless defined otherwise is assumed to be less than 3 years and long term is defined as greater than 3 years. These time frames are based on best professional judgment.

Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

A watershed cumulative impact can be defined as the total impact, on runoff, erosion, sediment or water yield, riparian areas and/or water quality that result from the incremental impact of a proposed action, when added to other past, present and reasonably foreseeable future actions occurring within the same natural drainage basin, or watershed (CEQ 1997).

Past activities or disturbance within the watersheds include beetle killed trees, grazing, mining, road construction and maintenance, and vegetation treatments. Past, present and reasonably foreseeable vegetation treatments are summarized in table 23 in the DEIS.

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Since no activities are proposed in alternative 1, there would be no direct effects to water quality, water quantity and channel stability, or wetlands and floodplains from this alternative. No indirect impacts to floodplains or wetlands would occur; and wetlands and streams would continue to be protected by RCAs under this alternative. Vegetation recovery in areas harvested in the past would continue to recover leading to hydrologic recovery within project watersheds.

The effects of the no-action alternative would be consistent with the goals and objectives of TMDL water quality planning efforts in the project area; however, would do nothing to reduce sediment and improve water quality in the project area.

Present conditions and trends for water quality, water quantity, riparian areas, floodplain and flood-prone areas, and stream channels would continue. Roads with poor drainage may continue to be a source of sediment and runoff to streams, adding to sedimentation from past, future and other existing sources in project watersheds, including recreation, livestock grazing and mining.

Flood repairs after the 2011 spring runoff would occur with a focus on the Douglas Creek watershed in 2012 or 2013. This work would consist of bridge and culvert repair, and road surfacing. This effort would be a beneficial effect in the long run to stream water quality because of reduced risk of crossing failure. Ongoing scheduled maintenance would also reduce sediment and contribute to increased water quality.

The storm-damage road repairs scheduled for reclamation and mine-waste removal at the Forest Rose Mine and Mill CERCLA Project, scheduled for July 2012 would improve water quality in Dunkleberg Creek.

Beetle killed tree mortality in lodgepole pine and other species may lead to the reduction of overstory trees, though overall a recovery of hydrologic flow regimes due to continued vegetative recover would be expected.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Measurement Indicators

Issue - Water Quality

Indicator- Changes in sediment delivery.

Measure- Consistency of the project with total maximum daily loads (TMDLs)

The effects of this project would be consistent with the goals and objectives of TMDL water quality planning efforts in the project area. Water quality impaired TMDL and 303(d)-listed streams would be protected because best management practices, project design features, and required RCA stream buffers would be implemented. Target values for road and upland sediment sources for Barnes Creek specified in the Draft Flint Creek Planning Area Sediment and Metals TMDLs and Framework Water Quality Improvement Plan (Montana 2012, table 2) would not be exceeded because 1.1 percent of the lands within the Barnes Creek watershed would be harvested under this alternative (table 81). There are no haul route stream crossings proposed in this watershed that could act to deliver sediment to Barnes Creek. Effective water quality project design feature such as BMPs (available in the project file) would be in place to address sediment generated from project activities and haul roads. Long-term indirect effects to water quality would not be expected. Water quality beneficial uses would not be impaired.

Measure- Changes in sediment delivery to streams and sedimentation rates based on WEPP Road model and sedimentation risk from haul routes

WEPP Road Model

For haul routes, the Road WEPP model (an erosion prediction program) was used to estimate potential annual sediment generation at sediment source areas for nine stream crossings on project haul routes within the Gold Creek watershed. Active sediment source areas were not identified at stream crossings in other watersheds within the project area. Additional sediment source areas may exist at stream crossings at areas that were not accessible during field surveys. With the application of BMPs and road improvements planned for this project all sediment source areas associated with stream crossings should see a reduction similar to those observed for stream crossings shown in table 79 for sites in the Gold Creek watershed.

Modeled stream crossings are located on the National Forest System road (NFSR) network used to access treatment areas for both action alternatives. In alternative 2, 68 miles of NFS roads would be used to access treatments areas. In modeling, three scenarios were evaluated: current traffic levels, high traffic levels which would occur during project implementation and high traffic levels with a gravel or native surface. Road measurement data collected during field surveys in the summer of 2011 were incorporated into the Road WEPP model. Modeled road segments included up to several hundred feet of road leading to channel crossings. Using guidelines suggested by Elliott et al. (1999), current traffic levels are considered low and traffic levels during project implementation would be considered high. A graveled or native surface with a soil texture of silt loam was mostly used during modeling for the existing condition and for the high traffic levels. Road WEPP modeling results are displayed in table 79.

Table 79. Road WEPP modeling results for alternatives 2 for project major haul routes stream crossings within the Gold Creek watershed

Site	Existing Average annual sediment (lb.)	Average annual sediment during project (lb.) BMPs in place*	Post-Project Average annual sediment (lb.) BMPs in place*
NFSR 636 @ Gold Creek	117	117	96
NFSR 636 uphill of Davidson Ck stream crossing	543	565	441
NFSR 78472 adjacent to unit 16P(un-named trib. to Gold Creek))	538	286	97
NFSR 636 S. Fork Gold Ck crossing nr unit 45S	186	186	145
NFSR 8615 into unit 8B (un-named trib. to Blum Ck)	26	32	15
NFSR 636 @ N. Gold Ck crossing	123	123	123
NFSR 1557 @ Crevice Creek crossing	387	316	137
NFSR 1557 near unit 10P (un-named trib. to N. Gold Ck)	403	316	316
NFSRs 78461/636 jct. Intermittent stream crossing	438	204	89
Total Sediment Delivered to Streams (pounds)	**2,761**	**2,145**	**1,459**

* BMPs consist of a variety of road maintenance improvements and reconstruction actions based on local conditions and include project design features. The proposed actions are identified in appendix a of the Transportation report in the project file.

WEPP modeling shows that sediment erosion and delivery is possible from roads used for the project, as shown for segments leading to stream crossings. Road WEPP analysis indicates that under current traffic conditions sediment production ranged from 26 pounds to 543 pounds for project road-stream crossings. Results of model runs for sediment produced during the project range from 32 pounds for the NFS 8615 road accessing unit 8B, to 565 pounds for the NFS 636 road upstream of Davidson Creek (table 79). Comparison of before, during and after project sediment values indicates that there would likely be an overall decrease in sediment during and after the project from roads. This is a result of implementation of road sediment reduction BMP upgrades or road reconstruction for improved drainage. Sediment reduction methods at road crossings would also include placing slash windrow, or equivalent methods, at runoff points at stream crossings. This was not modeled, but would further reduce sediment both during and after the project. Monitoring on National Forest System lands has shown up to 85 percent reduction in sediment delivery to streams from the use of slash windrows (Seyedbagheri 1996).

The results from WEPP modeling are comparable to measurements of road sediment in field studies and the level of sedimentation is positively correlated to higher traffic volume (Bilby et al. 1989; Luce and Black 1999; Forsyth et al. 2005). These same studies all show that the largest proportion, up to 80 percent of sediment from roads is very fine-grain, suspendable material (0.005-0.02 mm); (Bilby et al. 1989; Luce and Black 1999; Forsyth et al. 2005), probably created

by the action of tires grinding on road particles. Particles in this size class would be suspended in running water and probably only filtered out through infiltration into soil (Bilby et al. 1989).

Increases in traffic levels from project activities would most likely occur during the dry season, when the precipitation is low. Western Montana is characterized by a semi-arid climate with dry summers, which limits erosion potential during the dry season (Sugden and Woods 2007). Several studies (Bilby et al. 1989; Forsyth et al. 2005 Sheridan et al. 2006) document that sediment production is greatest early in the wet season following high traffic dry season, or from any storm with measureable runoff following a substantial period of dryness.

Roads that were modeled for sediment production are summarized with specific project design features for maintenance or to address sediment concerns. This information is provided in the hydrology report in the project record (table 6). In addition, slash filter windrows or equivalent methods are recommended for all stream crossings, and are included in the project design features.

All roads in the forest are a significant source of sediment that can be successfully mitigated through the use of best management practices (Burroughs and King 1989). Best management practices and project design features would be employed to reduce sediment from all roads used for this project. The effectiveness of BMPs in controlling sediment on National Forest System land has been documented (Burroughs and King 1989, Montana 2008). The State of Montana's 2008 Forestry Best Management Practices Monitoring BMP Audit Report conducted BMP monitoring on seven Forest Service sites and one Bureau of Land Management site. These sites are referred to in the report as "Federal" sites. Overall, 96 percent of the BMPs were rated as "meets or exceeds", meaning that they were implemented correctly for Federal sites. The overall rating for effectiveness of BMPs on Federal sites was 96 percent, which meant that adequate protection was provided. BMPs that were applied where there was a great risk of impacting water quality were also evaluated separately and were labeled "high risk BMPs". For Federal sites, these BMPs were applied and 89 percent of the practices rated "meets or exceeds" for implementation. For effectiveness of these BMPs, 91 percent of the applied BMPs were rated as providing adequate protection. The effectiveness of streamside management zones, which function in part as buffer strips, was rated as 97 percent effective (Montana 2008).

Sedimentation Risk from Haul Routes

Road maintenance and reconstruction on haul routes, including 10.6 miles within RCAs for perennial and intermittent streams, would be completed, improving the function of water and sediment control measures such as road crowning, condition of ditches, ditch blocks and rolling dips, and culvert function. This action would further reduce the amount of sediment being introduced into streams, as well as the amount of water from road-surface runoff. Reconstruction includes existing 4.4 miles of existing open and closed unauthorized routes. Some of these existing routes are in poor condition as a result of no maintenance or BMP implementation, and could be an on-going sediment source to streams, while other unauthorized routes are overgrown or stable and not considered sediment sources. Reconstruction of these routes would lead to an overall reduction in potential sedimentation, because as a result, many of these roads would show improved drainage. After vegetation treatments, unauthorized routes would be decommissioned. Specific decommissioning treatments are specified table 5 in chapter 2, and range from closure with a sign or berm and natural revegetation to blocking access and recontouring drainages.

Road maintenance-related upgraded BMPs would help to reduce the amount of generated sediment, but not completely eliminate the risk of sediment delivery. Although some short-term

water quality indirect effects such as local erosion and sedimentation may occur immediately after road maintenance, with the implementation of BMPs the amount of sediment would be minimal and not be expected to modify water quality, stream channel morphology or stability.

Miles of proposed haul routes were determined in select drainages of major project streams. Stream crossings, proposed new temporary and proposed National Forest Systems roads within 300 feet of streams were also calculated (table 80).

The highest risk of sediment delivery under alternative 2 to these streams would be from new road construction within RCAs, including proposed temporary and NFS road construction, followed by drainages with the highest number of stream crossings. New road construction exposes soil and may increase erosion and sediment delivery to streams, especially when located in RCAs. Existing haul road mileages were highest in the Gold Creek drainage, and within that drainage were highest in the North Fork sub-drainage. North Fork Gold creek under alternative 2 would have three major haul route stream crossings, and 0.3 miles of new road construction within 300 feet of streams. Gold Creek drainage is probably the highest risk area for potential sediment delivery to streams overall from haul roads within the project area.

The highest risk of sedimentation from new road construction in RCAs would occur in North Fork Gold Creek. The highest number of haul-route stream crossings would occur in Dunkleberg Creek, Blum Creek and the Douglas Creek drainages. For drainages with stream crossings, highly effective BMPs such as slash windrows would be used to reduce the potential for sediment delivery to streams. Where construction of new roads within 300 feet of streams will occur, BMPs designed to help avoid impacts to water quality including sediment delivery to streams will be used to reduce short- and long-term impacts. Short-term risks and impacts for new road construction would be ground-disturbance and soil compaction that could lead to indirect effects such as soil erosion. Long-term impacts once roads are constructed would be potential road drainage problems.

Table 80. Alternative 2-miles of haul routes, temporary roads, and proposed temporary or new NFS roads, and number of stream crossings within 300 feet of selected streams

Streams	Haul Routes (miles)	Haul Routes in RCAs (miles)	Temporary Roads Including newly constructed and unauthorized routes (miles)	Haul Route Major Stream Crossings	Proposed Temporary or new NFS roads within 300 ft. of streams (miles)	Notes
Dunkleberg Creek	7.9	0.6	0.9	6	0.1	Temporary road has two major stream crossings in trib. to Dunkleberg Ck.
Douglas Creek Mainstem	4.8	0.0	0.7	0	0.0	Sediment deposits observed from 2011 flooding from road washout in N. Fk. Douglas Creek.
South Fk Douglas Creek	1.1	0.6	0.0	1	0.0	

Streams	Haul Routes (miles)	Haul Routes in RCAs (miles)	Temporary Roads Including newly constructed and unauthorized routes (miles)	Haul Route Major Stream Crossings	Proposed Temporary or new NFS roads within 300 ft. of streams (miles)	Notes
Middle Fk. Douglas Creek	0.8	0.8	0.0	1	0.0	
North Fk. Douglas Creek	5.6	2.3	1.8	2	0.0	High sediment from road washout in upper watershed in 2011. Sediment deposits evident downstream.
Gold Creek Mainstem	11.6	1.4	0.0	1	0.0	Gold Creek mainstem is located on private lands.
N. Fk. Gold Creek	14.4	1.0	1.3	3	0.3	This drainage has the highest amount of new road constructed in RCAs.
S. Fk. Gold Creek	1.1	0.3	0.0	1	0.0	
Blum Creek	9.6	0.6	1.4	4	0.0	High numbers of stream crossings, but most are not sediment sources.
Crevice Creek	3.7	1.1	0.2	3	0.0	
Pikes Peak Creek	0.0	0.0	0.0	0	0.0	
Flint Creek Tributary/Gird Creek	5.0	1.9	2.0	2	0.2	Haul road parallels Gird Creek within RCA for 2.3 miles. Temporary road parallels a tributary to Flint Creek for 0.2 miles.

Note- information obtained from estimates based on Proposed Action map

Measure- Changes in sediment from harvest units from Disturbed WEPP

Projected estimates of erosion, based on Disturbed WEPP modeling for each proposed unit, showed no measurable erosion delivered to streams from project units after harvest (Soils section). Probabilities for runoff and sediment delivery range from 0 to 2 percent for each proposed unit (Soils section).

When conducting Disturbed WEPP modeling, the required widths for RCA buffers were included in the modeling. BMP monitoring demonstrates that these buffers are effective in preventing or mitigating the amount of sediment entering a stream (Montana 2008, Schuler and Briggs 2000, Rashin et al. 2006, USDA Forest Service 1999 and 2006).

Measure- Miles of new NFS or temporary road construction

Alternative 2 would construct 7.2 miles of new temporary road and 1.3 mile of new NFS roads. For the Gold Creek watershed, 3.4 miles of new temporary road construction is proposed, 2.9 miles in Lower Flint Creek-Gird Creek watershed, 0.9 miles in Douglas Creek watershed, and 0.3 miles in the Dunkleberg watershed. Proposed NFS and temporary roads outside of RCAs in upland areas would be low-risk for delivering sediment to streams. Miles of new construction in RCAs is discussed in the next section of this report. All newly constructed temporary roads would be decommissioned by obliteration following project implementation. BMPs and project design features for temporary roads should be effective at reducing sediment amounts generated from construction of new temporary roads.

Construction of logging roads exposes soil and increases the susceptibility to erosion and transport of sediment to streams (Kochenderfer et al. 1997; Swift 1985, 1988). The greatest input of sediment from roads generally occurs during construction and active log haul during timber harvest. Sediment erosion and delivery is possible within 1 or 2 years after construction, in areas immediately adjacent to where road construction or road reconstruction activities occurred (Luce and Black 1999, 2001), and during log haul. Longer-term effects (over 3 years after disturbance) such as erosion and delivery of sediment would not be expected for this alternative due to improvements in road drainage and implementation of BMPs during activities and once activities are completed.

Construction of forest roads can be a considerable source of sediment that can be successfully mitigated through the use of best management practices (Burroughs and King 1989) and project design features. Road BMPs would be applied during construction that would reduce, but not completely eliminate the risk of generating sediment. Increases in sediment would be expected to be limited to 1 year or less (Sugden and Woods 2007). Although some short-term water quality indirect effects such as local erosion and sedimentation may occur immediately after temporary road construction and during use, with the implementation of BMPs, the amount of sediment would be minimal and not expected to modify water quality, stream channel morphology or stability.

Measure- Miles of new system or temporary roads within 300 feet of streams

New temporary road construction would take place on 0.2 miles within RCAs in the Lower Flint Creek-Gird Creek watershed, 0.1 miles within RCAs in the Clark Fork Dunkelberg Creek watershed, and 0.3 miles within RCAs in Gold Creek. New temporary road construction near stream channels has the highest risk of delivering sediment to streams because of soil disturbance and displacement. The temporary road segments T3 in unit 55C (Lower Flint Creek-Gird Creek) and T17 leading into unit 23C would have the highest risk of sediment delivery to channels of proposed project temporary roads due to proximity to stream channels.

Temporary roads in RCAs generally pose one of the highest risks of contributing road-derived sediment. BMPs such as waterbars spaced at intervals to divert surface flows on temporary roads would be implemented that would substantially reduce the risk of sediment erosion and delivery to channels.

Although some short-term water quality indirect effects such as local erosion and sedimentation may occur immediately after temporary road construction and during use, with the implementation of BMPs the amount of sediment would be minimal, and not be expected to modify water quality, stream channel morphology or stability.

Measure- New haul route stream crossings and sediment delivery at stream crossings

One new stream crossing would be constructed on a temporary haul route (T3) in Lower Flint Creek-Gird Creek under this alternative. Stream crossings, wetland crossings, and the approaches of roads to these areas are sources of the majority of sediment contribution to streams and wetlands (Swift 1988) especially where BMPs have not been properly applied (Stuart and Edwards 2006). There are numerous existing road stream crossings on proposed log haul routes. WEPP Road modeling results document sediment production from road segments leading to stream crossings. With the implementation of BMPs the amount of sediment would be minimal, and not be expected to modify water quality, stream channel morphology or stability.

Indicator: Stream temperature changes.

Measure – Roads and openings in Riparian Conservation Areas

As stated above, new temporary road construction would take place on 0.2 miles within perennial stream RCAs for Lower Flint Creek-Gird Creek watershed, 0.1 miles within intermittent stream RCAs in the Clark-Fork Dunkelberg Creek watershed, and 0.3 miles within both intermittent and perennial RCAs in Gold Creek. This would lead to a reduction in shade within RCAs. The RCA for perennial streams extends 300 feet on either side of the stream, whereas on intermittent streams the RCA extends 50 feet on either side of the drainage. Proposed RCAs would be sufficient to protect streams from direct beam solar radiation that could lead to stream temperature increases under this alternative. Roads can open streams to direct-beam solar radiation leading to warmer stream temperatures. However, because roads would occupy a small area within the RCA, measurable project road-related impacts to stream temperature from new project haul routes would not be expected from this project.

Issue - Water Quantity and Channel Stability

Indicator- Change in water yield and peak flows resulting in channel changes

In summary, a stream system's channel morphology, including streambed and streambank stability, reflects the existing balance between stream flow, sediment input, and substrate/bank composition. If one of these components varies, there is a corresponding change with the other two. When peak flow is increased, there is an increase in the amount of energy available to transport sediment and erode streambanks. These changes in turn can potentially result in modifications to water quality and aquatic habitat.

For alternative 2, no notable changes in flow volume, or alteration to timing of peak flows would be expected resulting from treating proposed units. As a result, no impacts are expected to occur to channels within the project area.

Measure- Harvested area by 6th field HUC

Potential direct and indirect effects associated with vegetation treatments include a decrease in tree canopy and an associated increase in water available for stream flow. Areas of prescribed fire were not considered to be a significant factor affecting water yield because it will have a limited

effect on overstory vegetation density, and effects of prescribed fire are not included in the calculations.

The amount of harvested ground- or cable-based units have been determined for each watershed for National Forest System lands within the project boundary for this alternative in order to provide information on the percent watershed proposed to be harvested within each watershed (table 81). Harvest has also occurred on private lands adjacent to the National Forest, and mostly occurred in the 1980s, so currently it has a negligible effect on streamflows. Percent harvest information is used to estimate the amount of flow increases in project watersheds as a result of forest clearing, provided in the following "measure" discussion. The largest amount of harvest would occur in Gold Creek with 1317 acres of treatment, and 4.1 percent of the watershed followed by lower Flint Creek-Gird Creek watershed with 550 acres of commercial harvest, or 3.8 percent of the watershed. Other project watershed percent treatments range from 0-2 percent of the watershed areas.

Table 81. Total percent past harvest of project watersheds and proposed harvest for the proposed action

Watershed	Proposed Action Percent Harvest, All Treatment Types	Percent Watershed Involved in Past Vegetative Treatments*	Total Percent Harvested
Barnes Creek	1.1%	<1 %	1.1%
Clark Fork River-Dunkleberg Creek	1.3%	<1 %	1.3%
Clark Fork River-Perkins Creek	0.9%	<1 %	1.0%
Douglas Creek	2.0%	8.2%	10.2%
Gold Creek	4.1%	2.5%	6.6%
Lower Boulder Creek	0.0%	0.0%	0.0%
Lower Flint Creek-Gird Creek	3.8%	4.1%	7.9%
Pikes Peak Gulch	0.0%	1.5%	1.5%

*Most of the past treatments in the watersheds have recovered hydrologically,

Measure- Water yield increase greater than 10 percent

Timber harvest should not increase the peak water yield by more than 10 percent of historic conditions (State of Montana, 2012). Potential direct and indirect effects associated with vegetation treatments include a decrease in tree canopy and an associated increase in water available for stream flow. Timber harvest units are not expected to lead to sedimentation (Rice et al. 1971), but can lead to increased runoff and water yield (Troendle and King 1985), which can affect channel stability and stream function. The potential increase in water available for stream flow is due to decreases in interception and transpiration. In wet climates, this can increase annual water yield. Stednick (1996) noted that changes in annual water yield resulting from forest cover reduction in a watershed by forest harvest of less than 20 percent could not be determined through hydrometric or stream-flow measurement methods. Other research indicates that up to 25 percent of a watershed must be harvested before changes are detected. Grant et al. (2008) documented that although any disturbance that reduces the density of live vegetation cover will locally increase runoff from forested watersheds; flow increases are generally not measurable until about 25 percent of the basal area of a forested watershed has been harvested.

The existing canopy percent in proposed units range on average from about 10-70 percent (Gump 2012) depending on tree species. Canopy may be less than this amount in beetle killed dead lodgepole stands. After treatment, canopy would be estimated to be 0-30 percent depending on the treatment type. Watershed scale changes in canopy would not be expected to result in a measurable change to flow for several reasons. Table 81 shows the watershed percent that would be harvested, compared to existing harvest percentages from past harvest. Past harvest was mostly done in the 1980s and 1990s, and past harvest areas are mostly recovered hydrologically. Recent beetle killed trees may have contributed to canopy loss through mortality of overstory trees typically greater than 5 inches d.b.h. This does not likely translate into canopy loss in beetle killed stands however, because smaller trees not affected by insect mortality may still occupy sites. These smaller trees often will function to maintain evapotranspiration and moderate increases in water yield. Further, the distribution of dead and dying trees resulting from insect mortality was observed to be often not continuous and varies with difference in soil moisture and other factors.

The highest proposed harvest (4.1 percent) is in Gold Creek watershed, followed by 3.8 percent in Lower Flint Creek-Gird Creek watershed. Except in Gold Creek watershed, most of the proposed harvest in project watersheds would be treated by commercial thinning, with large, dominant trees left after treatment. Thinning would focus on taking suppressed intermediate sized trees (7-20 inches d.b.h.). As a result, substantial gaps in the canopy would not be generated and measurable increases in water quantity would not be expected in commercially thinned areas (Bosch and Hewlett 1982, Grant et al. 2008). Historical harvest on private lands, when added to percent watershed harvested amounts in alternative 2, is not expected to appreciably change percent watershed harvested values. Private and other agency lands would have to be extensively clearcut in order to increase percent harvest values to amounts needed to begin to see flow increases in project watersheds. For instance, the Gold Creek watershed has 20,624 acres in the project area; 18 percent or 3,712 acres would need to be recently harvested (within the last few years) to exceed 25 percent watershed harvest.

Salvage by clearcut areas or seed tree harvest areas make up a smaller percentage of harvest in most watersheds except Gold Creek, where over 500 acres of salvage by clearcut is proposed. Twelve salvage units, across the project area, would be over 40 acres in size in alternative 2, and these are factored in percent watershed harvested calculations. When harvest exceeds about 25 percent of watershed area measurable runoff increases may begin to occur. The overall percent of trees to be harvested, combined with past harvest is well under the threshold of about 25 percent for all watershed (table 81). Because watershed percent harvest is low compared to amounts required to start seeing increased water yields, no change in timing and magnitude of peak flows or annual water yield due to forest harvest is expected. Estimated project flow increases would be below 10 percent for the project. Overall, total water availability increases after initial harvest would be small and essentially not measureable. As trees grow back in harvested areas, evapotranspiration would increase, and more incoming precipitation would be taken up by vegetation or evaporated. In turn, less water would be available to re-supply shallow and deep groundwater, and less will be available for runoff.

Issue - Floodplains and Wetlands

Indicator- Changes in floodplain and wetland function

Measure- New stream crossings in floodplains

Floodplain development is not proposed for the project. No direct or indirect effects to floodplains, their morphology or function would be expected due to the implementation of BMPs

and project design features for units and roads, and implementation of RCA buffers. No adverse effects are expected to floodplains from new temporary road stream crossings on perennial Gird Creek, and stream crossing construction on the temporary road crossings on the intermittent tributary to Dunkleberg Creek.

Measure- Protection of wetlands provided by RCAs, and other project design features

Wetlands would be protected by RCAs under this alternative. BMPs and project design features and mitigation measures were also designed to prevent, or limit, upland sediment introduction into wetlands and streams (appendix B of the Hydrology report in the project file). Included in these protection measures is the mandatory use of RCAs. Stream buffer effectiveness is documented in Montana (2008), Schuler and Briggs (2000), Rashin et al. (2006), and USDA Forest Service (1999 and 2006). Other studies have documented effectiveness of stream buffers in reducing sediment transport to wetlands or streams. No wetlands or springs have been identified in project units, but if they are discovered during layout these areas would be protected during logging operations by establishing RCAs or buffers around wetland features. Springs that were observed along roads such as NFS road 636 would be protected through improved road drainage that would route spring drainage off road surfaces. As a result of the presence of RCAs and the use of other project design features no direct or indirect effects resulting from the project would be anticipated.

No commercial thinning, salvage by clearcut, or seed trees harvest would be conducted within RCAs. No direct ignition would occur within RCAs. Fire would be allowed to creep (back burn) into RCAs from the point of ignition. Short-term direct effects of back burning may consist of partial groundcover removal. Indirect effects such as erosion and transport of sediment would be considered unlikely due to implementation of BMPs, prohibition of ignition within RCAs, maintenance of groundcover throughout the majority of the RCAs, and burning only when soils are moist and cool.

Cumulative Effects

In summary, no cumulative effects from this project are expected from sediment generation from roads and other activities.

No measureable cumulative increases in stream temperatures are expected from this project. No measureable cumulative effects to channels are expected from water yield increases. Positive impacts from mining-related activities such as the Forest Rose Mine reclamation would lead to water quality improvements and a reduction of cumulative effects on Dunkleberg Creek. Other ongoing and future expected impacts such as livestock grazing or recreation are not expected to generate cumulative effects when combined with the effects of this project. When combined with other past, present and expected future activities in project watersheds, no measurable changes to water quantity, stream channel conditions, wetlands, springs or floodplains would be expected from this project. No measurable negative effects to water quality is expected.

Sedimentation from past activities has occurred, is ongoing or may occur in the future in the project area. Cumulative effects from sedimentation can include channel widening and bank instability, changes in channel substrates from fine sediment, or longer term increases in stream turbidity. Any sediment generated by roads used for this project would add to existing amounts of sediment in project watersheds. However, with the implementation of BMPs and other project design features and mitigation measures, sediment generation would be expected to be reduced overall in project watersheds compared to existing conditions. Sedimentation from the activities proposed for alternative 2 would not be expected to increase, including haul route road

maintenance or construction activities, road drainage at stream crossings, and increased traffic levels. Any effects to sedimentation from this project would be of short duration, usually occurring within the same year the activity takes place, and would not add sediment in amounts where cumulative effects of sedimentation would be expected to occur. After the project is complete, improvements in road drainage leading to sediment reduction as a result of road maintenance and road mile reduction would be expected to reduce sediment delivered to waterways.

Flood repairs after the 2011 spring runoff would occur with a focus on the Douglas Creek watershed in 2012 or 2013. This work will consist of bridge and culvert repair, and road surfacing. This effort would be a beneficial effect in the long run to stream water quality because of reduced risk of crossing failure. Positive impacts from mining-related activities such as the Forest Rose Mine reclamation would lead to water quality improvements and a reduction of effects in Dunkleberg Creek. Ongoing scheduled maintenance would also reduce sediment and contribute to increased water quality.

No measureable cumulative increases in stream temperatures are expected from this project. No measureable cumulative effects to channels are expected from water yield increases. Other ongoing and future activities such as livestock grazing or recreation are not expected to generate cumulative effects to the RCAs or water quality when combined with the effects of this project. When combined with other past, present and expected future activities in project watersheds, no measurable changes to water quality, quantity, stream channel conditions, wetlands, springs, or floodplains would be expected from this project.

Potential direct and indirect effects associated with vegetation treatments include a decrease in tree canopy and an associated increase in moisture availability that can lead to more water available for stream flow. The potential cumulative increase in water available for stream flow after harvest is due to changes in interception and transpiration. However, for this project, when combined with other activities that affect vegetation in project watersheds, measureable cumulative increases in stream flow are not expected. As trees grow back in harvested areas, evapotranspiration would increase, and more incoming precipitation would be taken up by vegetation or evaporated.

Summary of Effects

Activities under this alternative include ground disturbance resulting from vegetation treatments, prescribed and pile burning, use of skid trails, hauling logs, and road construction reconstruction and maintenance.

Sediment delivery to streams from roads poses the greatest risk to water quality. BMPs and project design features would be employed for all roads used for this project, and are demonstrated to be effective at reducing sediment delivery to waterways. RCA buffers would prevent sediment from reaching channels, and as a result, minimal amounts of sediment would be expected to pass through these buffers and enter stream channels. Sediment-related water quality changes would be expected to be minimal. Increases in sediment, if it occurs, would be expected to be limited to 1 year or less. No measurable change to channels would be expected from harvest activities.

Potential direct and indirect effects associated with vegetation treatments include a decrease in tree canopy and an associated increase in water available for runoff. Because watershed percent

harvest is low compared to amounts required to realize increased water yields, no change in timing and magnitude of peak flows or annual water yield due to forest harvest is expected.

Target values for road and upland sediment sources for Barnes Creek specified in the Draft Flint Creek Planning Area Sediment and Metals TMDLs and Framework Water Quality Improvement Plan (Montana 2012, table 2) would not be exceeded. No additional degradation to 303(d)-listed streams would be expected with the implementation of soil and water quality BMPs, implementation of the required RCAs and improvements to road drainage. Any changes to stream water quality would probably not be measurable relative to natural variation.

With no or minimal sediment introduction to any of the stream drainages as a result of the project, no cumulative changes to stream channel morphology, substrates or turbidity would be expected. After the project is complete, improvements in road drainage leading to sediment reduction as a result of road maintenance and road mile reduction would be expected to reduce sediment delivered to waterways.

Minimal changes to water quantity, stream channel conditions, riparian areas, wetlands springs or floodplains would be expected due to the implementation of BMPs and project design features for units and roads. As a result, no notable cumulative effects for these resources would be expected.

Overall, watershed conditions would be expected to improve with the implementation of the proposed action, due to road maintenance and implementation of BMPs along the project road system.

Alternative 3

Under alternative no new road construction would occur. Only existing NFS or existing open or closed unauthorized routes would be used as haul routes.

Direct and Indirect Effects

Indicators and Effects Measures

Issue - Water Quality-

Indicator- Change in sediment delivery

Measure- Consistency of the project with total maximum daily loads (TMDLs)

The effects of this project would be consistent with the goals and objectives of TMDL water quality planning efforts in the project area. Target values for road and upland sediment sources for Barnes Creek specified in the Draft Flint Creek Planning Area Sediment and Metals TMDLs and Framework Water Quality Improvement Plan (Montana 2012, table 2) would not be exceeded, since only 1.1 percent of the lands within the Barnes Creek watershed would be harvested under this alternative (table 83). Effective water quality project design features such as BMPs would be in place to address sediment. Long-term indirect effects to water quality would not be expected. Water quality beneficial uses would not be impaired.

Measure- Changes in sediment delivery to streams and sedimentation rates based on WEPP Road model and sedimentation risk from haul routes

WEPP Road Model

Road WEPP modeling that was done for major haul routes for alternative 2 is used for this alternative (table 79). The major haul routes where sediment source assessments were done are the same for both alternatives.

Road WEPP analysis indicates that under current traffic conditions sediment production ranged from 26 pounds to 543 pounds for project road-stream crossings. Results of model runs for sediment produced during the project range from 32 pounds for the NFS 8615 road accessing unit 8B, to 565 pounds for the NFS 636 road upstream of Davidson Creek (table 79). Comparison of before, during and after project sediment values indicates that there would likely be an overall decrease in sediment during and after the project from roads. This is a result of implementation of road sediment reduction BMP upgrades or road reconstruction for improved drainage. Sediment reduction methods at road crossings would also include placing slash windrows, or equivalent methods, at runoff points at stream crossings. This was not modeled, but would further reduce sediment both during and after the project. Monitoring on National Forest System lands has shown up to 85 percent reduction in sediment delivery to streams from the use of slash windrows (Seyedbagheri 1996).

Roads that were modeled for sediment production are summarized with recommended specific project design features for maintenance or design features to address sediment concerns. This information is provided in the hydrology report in the project record. As in alternative 2, BMPs will be employed to reduce sediment from all roads used in this alternative. The effectiveness of BMPs in controlling sediment on National Forest System land has been documented (Burroughs and King, 1989, Montana 2008). In addition, slash filter windrows or equivalent methods are recommended for all stream crossings, and are included in the project design features.

Sedimentation Risk from Haul Routes

The potential amount of sediment delivery risk to streams from the project road system is less from this alternative than alternative 2 because no new road segments or crossings would be constructed. New temporary road construction near stream channels has the highest risk of delivering sediment to streams because of soil disturbance and displacement. Sediment delivery and erosion occurring because of road maintenance and reconstruction would be less in this alternative than in alternative 2, because there would be about 12 fewer miles of haul routes (including unauthorized routes).

Road maintenance and reconstruction (9.5 miles) would occur within RCAs along perennial and intermittent streams improving water function and sediment control measures such as road crowning, condition of ditches, ditch blocks and rolling dips, and culvert passage. This would further reduce the long term amount of sediment being introduced into streams, as well as the amount of water from road-surface runoff. The reconstruction includes 2.3 miles of existing open and closed unauthorized routes. Some of these existing roads are in poor condition as a result of no maintenance or BMP implementation, and could be an on-going sediment source to streams, while other unauthorized routes are overgrown or stable and not considered sediment sources. Reconstruction of these routes would lead to an overall reduction in potential sedimentation, because as a result, many of these roads would show improved drainage. After vegetation treatments, unauthorized routes would be decommissioned. Specific decommissioning treatments

are specified table 5 in chapter 2, and range from closure with a sign or berm and natural revegetation to blocking access and recontouring drainages.

Comparisons of haul road miles and other factors were made to determine effects in drainages of major streams. Highest road miles for existing proposed haul routes are in N. Fork Gold Creek, Gold Creek Mainstem and Blum Creek. Major proposed haul route stream crossings were highest for Blum and Dunkleberg Creeks (table 82).

Table 82. Alternative 3-miles of haul routes, temporary roads, and proposed temporary or new NFS roads, and number of stream crossings within 300 feet of select streams

Streams	Haul Routes (miles)	Haul Routes in RCAs (miles)	Unauthorized Routes, (miles)	Haul Route Major Stream Crossings	Temporary or New NFS Roads within 300 ft. of Streams (miles)	Notes
Dunkleberg Creek	6.9	0.6	0.9	4	0.0	
Douglas Creek Mainstem	4.1	0.0	0.0	0	0.0	Sediment deposits observed from 2011 flooding from road washout in N. Fk. Douglas Creek.
South Fk Douglas Creek	1.1	0.6	0.0	1	0.0	
Middle Fk. Douglas Creek	0.8	0.8	0.0	1	0.0	
North Fk. Douglas Creek	3.8	2.3	0.0	2	0.0	High sediment from road washout in upper watershed in 2011. Sediment deposits evident downstream.
Gold Creek Mainstem	11.6	1.4	0.0	1	0.0	Gold Creek mainstem is located on private lands.
N. Fk. Gold Creek	12.2	1.0	0.0	3	0.0	
S. Fk. Gold Creek	1.1	0.3	0.0	1	0.0	
Blum Creek	8.2	0.6	0.8	4	0.0	High numbers of stream

Streams	Haul Routes (miles)	Haul Routes in RCAs (miles)	Unauthorized Routes, (miles)	Haul Route Major Stream Crossings	Temporary or New NFS Roads within 300 ft. of Streams (miles)	Notes
						crossings, but most are not sediment sources.
Crevice Creek	3.1	1.1	0.0	3	0.0	
Pikes Peak Creek	0.0	0.0	0.0	0	0.0	
Flint Creek Tributary/ Gird Creek	3.0	0.9	0.0	2	0.0	

(Note- information obtained from estimates based on alternative 3 map)

Measure- Changes in sediment from harvest units from Disturbed WEPP

Projected estimates of erosion, based on Disturbed WEPP modeling for each proposed unit, showed no erosion delivered to streams from project units after harvest (Soils section), and were similar to alternative 2. Probabilities for runoff and sediment delivery range from 0 to 2 percent for each proposed unit (Soils section). Based on these factors indirect effects including erosion and sediment generation and delivery to streams would not be expected as a result of unit harvest treatment.

When conducting Disturbed WEPP modeling, the required widths for RCA buffers were included in the modeling. BMP monitoring demonstrates that these buffers are effective in preventing or mitigating the amount of sediment entering a stream (Montana 2008, Schuler and Briggs 2000, Rashin et al. 2006, USDA Forest Service 1999 and 2006).

Measure- Miles of new NFS or temporary road construction

In this alternative, because no new roads are proposed, there would be no potential increased sedimentation from new road construction. Because there will be no new construction of roads, the risk of sediment reaching stream channels would be lower than alternative 3, especially where new road construction would have taken place within RCAs. Although the precise amount of sediment reduction under this alternative is unknown, from WEPP modeling of known haul route sites sediment production from road segments leading to channel crossings ranged up to over 500 pounds/crossing. Fewer miles of temporary or other roads are likely to lead to less risk of sediment production from roads. This alternative would likely result in a notable reduction in potential sediment from the construction of temporary or other roads.

Measure- Miles of new system or temporary roads within 300 feet of streams

Road construction disturbs soils and increases the potential for erosion during and after construction. Because there will be no new construction of roads, the short-term risk of sediment

reaching stream channels would be lower than alternative 2 where the 0.6 miles of new road construction would take place within RCAs.

Measure- New haul route stream crossings and sediment delivery at stream crossings

No new stream crossings are required under this alternative. This would decrease the short-term risk of sediment reaching channels compared to alternative 2.

Indicator: Stream Temperature changes

Measure- Roads and openings in RCAs

Proposed RCAs would be sufficient to protect streams from direct beam solar radiation that could lead to stream temperature increases under this alternative. The RCA for perennial streams extends 300 feet on either side of the stream, whereas on intermittent streams the RCA extends 50 feet on either side of the drainage. Existing roads can open streams to direct-beam solar radiation leading to warmer stream temperatures. Under this alternative no new roads will be constructed in RCAs so no additional project road-related impacts to stream temperature from project haul routes would be expected (MacDonald et al.1991).

Issue - Water Quantity and Channel Stability

Indicator- Changes in water yield and peak flows resulting in channel changes

In summary, potential impacts to stream channels will be similar to alternative 2, and not be expected to modify stream channel morphology or stability. No significant changes in flow volume, or alteration to timing of peak flows would be expected resulting from treating proposed units. As a result, no impacts are expected to occur to channels within the project area.

Measure- Harvested area by 6th field HUC

Approximately 600 fewer acres of mechanically harvested, ground- or cable-based harvest units are proposed under this alternative, across all watersheds, compared with alternative 2. When acres of historical logging are added to acres of proposed logging under this alternative, percent watershed harvested areas is less under this alternative than alternative 2.

Table 83. Total percent past harvest of project watersheds and proposed harvest for alternative 3

Watershed	Alternative 3 Percent Harvest, All Treatment Types	Percent Watershed Involved in Past Vegetative Treatments*	Total Percent Harvested
Barnes Creek	1.1%	<1 %	1.0%
Clark Fork River-Dunkleberg Creek	1.1%	<1 %	1.0%
Clark Fork River-Perkins Creek	0.7%	<1 %	1.0%
Douglas Creek	0.5%	8.2%	8.7%
Gold Creek	3.8%	2.5%	6.3%
Lower Boulder Creek	0.0%	0.0%	0.0%
Lower Flint Creek-Gird Creek	1.5%	4.1%	5.6%
Pikes Peak Gulch	0.0%	1.5%	1.5%

Measure- Water yield increase greater than 10 percent

Similar to alternative 2, water yield increases greater than 10 percent as a result of the project are not expected.

Issue - Wetlands or Floodplains

Indicator-Changes in floodplain or wetland function

Measure- New stream crossings in floodplains

Floodplain development is not proposed for the project. No direct or indirect effects to floodplains, their morphology or function would be expected due to the implementation of BMPs and project design features for units and roads, and implementation of RCA buffers. No adverse effects are expected to flood plains from new temporary road stream crossings on the intermittent tributary to Dunkleberg Creek.

Measure- Protection of wetlands provided by RCAs and other project design features

Wetlands would continue to be protected by RCAs under this alternative. BMPs and resource protection measures were also selected and designed to prevent, or limit, upland sediment introduction into wetlands and streams (appendix B of the Hydrology report in the project file). As in alternative 2, no wetlands have been identified in project units, but if they are discovered these areas will be protected during logging operations by establishing RCAs or buffers around wetland features. Improved drainage along haul roads such as the NFS road 636 would route seeps and spring off the road surface and would reduce the risk of sedimentation in these areas. As a result the other presence of RCAs and use project design features no direct or indirect effects resulting from the project would be anticipated.

As in alternative 2, no commercial thinning, salvage by clearcutting, or seed tree harvest would be conducted within RCAs. No direct ignition would occur within RCAs or within riparian areas. In RCAs, only back burning would be allowed when soils are moist and temperatures cool. Short-term direct effects of back burning may consist of partial groundcover removal. Indirect effects such as erosion and transportation of sediment would be considered unlikely due to implementation of BMPs, prohibition of ignition within RCAs, maintenance of groundcover throughout the majority of the RCAs, and burning only when soils are moist and cool.

Cumulative Effects

Similar to alternative 2, no cumulative effects from this project are expected from sediment generation from roads and other activities.

Sedimentation from past activities has occurred, is ongoing or may occur in the future in the project area. Cumulative effects from sedimentation include effects such as channel widening and bank instability, changes in channel substrates from fine sediment, or longer term increases in stream turbidity. Any sediment generated by roads used for this project would add to existing amounts of sediment in project watersheds. However, with the implementation of BMPs and other project design features and mitigation measures, sediment generation would be expected to be reduced overall in project watersheds compared to existing conditions. Sedimentation from alternative 3 is not expected to increase as a result of project activities including haul route road maintenance or reconstruction activities, road drainage at stream crossings, and increased traffic levels, and overall be less than alternative 2. Any effects to sedimentation from this project would be of short duration, usually occurring within the same year the activity takes place, and would not add sediment in amounts to where cumulative effects of sedimentation would be expected to

occur. After the project is completed, improvements in road drainage leading to sediment reduction as a result of road maintenance and road mile reduction would be expected to reduce sediment delivered to waterways.

As in alternative 2, flood repairs after the 2011 spring runoff will occur with a focus on the Douglas Creek watershed. This work will consist of bridge and culvert repair, and road surfacing. This effort would be beneficial in the long run to stream water quality as vegetation grows back, and because of reduced risk of crossing failure. Positive impacts from mining-related activities such as the Forest Rose Mine reclamation will lead to water quality improvements and a reduction of effects in Dunkleberg Creek. Scheduled road maintenance would also reduce sediment and contribute to increased water quality.

No measureable cumulative increases in stream temperatures are expected from this project. No measureable cumulative effects to channels are expected from water yield increases. Other ongoing and future potential impacts such as recreation are not expected to generate cumulative effects when combined with the effects of this project. When combined with other past and anticipated future activities in project watersheds, no measurable changes to water quantity, stream channel conditions, wetlands, springs, or floodplains would be expected from this project.

Potential direct and indirect effects associated with vegetation treatments include a decrease in tree canopy and an associated increase in moisture availability that can lead to more water available for stream flow. The potential cumulative increase in water available for stream flow after harvest is due to changes in interception and transpiration. However, for this project, when combined with other activities that affect vegetation in project watersheds, measureable cumulative increases in stream flow are not expected. As discussed under direct and indirect effects, cumulative overall total water availability increases after initial harvest would be small and essentially unmeasurable. As trees grow back in harvested areas, evapotranspiration would increase, and more incoming precipitation would be taken up by vegetation or evaporated.

Summary of Effects

Activities under this alternative include ground disturbance resulting from vegetation treatments, prescribed and pile burning, use of skid trails, hauling logs, and road reconstruction and maintenance. Potential indirect effects include increased sediment introduction or delivery into streams, altering water quality or water quantity.

This alternative includes no new road construction, compared to the proposed action which proposes 1.3 miles of new NFS road construction, and no new miles of temporary road construction. 2.3 miles of existing temporary roads would reconstructed, which would be 2.1 miles less than alternative 2. As a result there would be no ground disturbance from new road construction under alternative 3 compared to alternative 2, and subsequently substantially less risk of sedimentation. Also, the risk in sediment delivery would be less for alternative 3 because of fewer haul route miles and no road construction in RCAs.

Sediment delivery to streams from roads poses the greatest risk to water quality. As in alternative 2 BMPs and project design features would be employed for all roads used for this project, and are demonstrated to be effective at reducing sediment delivery to waterways. RCA buffers would prevent sediment from reaching channels, and as a result, minimal amounts of sediment would be expected to pass through these buffers and enter stream channels. Sediment related water quality changes would be expected to be minimal. Increases in sediment, if they occur would be expected

to be limited to 1 year or less. No measurable change to channels would be expected from harvest activities.

Potential direct and indirect effects associated with vegetation treatments include a decrease in tree canopy and an associated increase in water available for runoff. Because watershed percent harvest is low compared to amounts required to realize increased water yields, no change in timing and magnitude of peak flows or annual water yield due to forest harvest is expected.

Target values for road and upland sediment sources for Barnes Creek specified in the Draft Flint Creek Planning Area Sediment and Metals TMDLs and Framework Water Quality Improvement Plan (Montana 2012, table 2) would not be exceeded. No additional degradation to 303(d) listed streams would be expected with the implementation of soil and water quality BMPs, implementation of the required RCAs and improvements to road drainage. Any changes to stream water quality would probably not be measurable relative to natural variation.

With no or minimal sediment introduction to any of the stream drainages as a result of the project, no cumulative changes to stream channel morphology, substrates or turbidity would be expected. After the project is complete, improvements in road drainage leading to sediment reduction as a result of road maintenance and road mile reduction would be expected to reduce sediment delivered to waterways.

Minimal changes to water quantity, stream channel conditions, riparian areas, wetlands, springs, or floodplains would be expected due to the implementation of BMPs and project design features for units and roads. As a result, no notable cumulative effects for these resources would be expected.

As a result of this alternative and due to the implementation of BMPs and project design features for units and roads, minimal changes to water quantity, stream channel conditions, riparian areas, wetlands springs or bogs, or floodplains would be expected. As a result, no notable cumulative effects for these resources would be expected.

Overall, watershed condition would be expected to improve with the implementation of alternative 3, due to road maintenance and reconstruction, and implementation of BMPs on the project road system.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

All alternatives comply with the Beaverhead-Deerlodge Forest plan, and other State and local laws, regulations, policies and plans.

At this time it is uncertain whether this project will require a National Pollution Discharge Elimination System (NPDES) permit for stormwater discharge from logging roads. The Forest Service will comply with any applicable NPDES permitting requirements if determined in the future that it is needed for this project

Fish and Aquatic Resources

Introduction

This section documents existing condition and environmental consequences to aquatic resources from the proposed Flint Foothills Vegetation Management Project. The analysis include the

potential effects to Forest Service sensitive and management indicator species (MIS), as well as aquatic species listed according to the endangered species act (ESA). These species include westslope cutthroat trout (*Oncorhynchus clarki lewsi*), western toad (*Bufo boreas*), arctic grayling (*Thymallus arcticus*) and bull trout (*Salvelinus confluentus*), western pearlshell mussel *(Margaritifera falcata)*, and the mayfly, *(Drunella doddsi).*

Overview of Issues Addressed

All fisheries habitat within the analysis area is confined to streams. Amphibians are present in streams, ponds, wetlands and their riparian areas, so all of these represent habitats that could be affected. Finally, direction in the Forest Plan requires that we analyze the potential for new projects to increase the risk of aquatic nuisance species introduction. Aquatic nuisance species introduction would result in mortality or displacement of individual trout and amphibians.

Issues and Measurement Indicators

Issue - Change in Stream Habitat Conditions for *Drunella doddsi* (MIS) and other Aquatic Species

- Indicator - Change in stream function:
  - Measure - Change in sediment delivery to streams
  - Measure - Changes in miles of motorized routes in RCAs

Issue - Change in Pond and Wetland Habitat Conditions for Aquatic Species

- Indicator - Change in sediment delivery to streams, ponds and wetlands
  - Measure - Change in miles of motorized routes in RCAs
  - Measure - Change in sediment delivery to ponds and wetlands

Issue - Persistence of Sensitive WCT populations within the Analysis Area

- Indicator - Habitat conditions for WCT occupied streams
  - Measure - Change in sediment delivery to occupied WCT streams in the analysis area
  - Measure - Changes in miles of motorized routes in RCAs

Issue - Persistence of Sensitive Western Toad Populations within the Analysis Area

- Indicator - Expected change in direct mortality to toads from motorized vehicles:
  - Measure - Change in miles of motorized routes in RCAs
  - Measure - Miles of haul routes in RCAs.

Issue - Change in distribution of Aquatic Nuisance Species (ANS)

- Indicator - Expected change in vectors of transport and introduction of ANS

Affected Environment

Existing Condition

The following sections describe the existing condition of the affected environment for aquatic resources in the Flint Foothills Project area and include the following: general watershed characteristics, overview of analysis areas, watershed descriptions, fish distribution, special status fishes, and special status amphibians. The existing condition of issue indicators is also described.

Watershed Description and Conditions

The analysis area totals 44, 493 acres and is located within portions of the Barnes Creek, Clark Fork River-Dunkleberg Creek, Clark Fork River-Perkins Creek, Douglas Creek, Gold Creek, Lower Flint Creek-Gird Creek and Pikes Peak Gulch 6th level watersheds (See figure 39 in the hydrology section for location of 6th level watersheds found in the Flint Foothills project area). Although the project boundary includes the upper portion of Barnes Creek, no vegetation or fuel management activities are planned in the Barnes Creek watershed, therefore it will not be discussed further.

Overview of Stream and Watershed Characteristics

The existing condition of project area streams and fish populations reflect the influences of both natural (climatic and geologic) conditions and human activities. Past management activities affecting aquatic resources include road construction and maintenance, timber harvest, livestock grazing, water diversion for irrigation, dispersed recreation, and historic mining.

The existing condition of riparian areas and wetlands are variable. Well-vegetated riparian areas filter pollutants from overland flow; provide habitat for wildlife, and stabilize and shade stream channels, which provide high quality habitat and minimize extreme variations in water temperature. Typically, linear wetlands are found along the low-gradient stream reaches. These wetlands serve as habitat for amphibians and other aquatic species, as well as storage for water during spring runoff. Wetlands release cool, clean water to the channel during the later parts of summer.

Sub-watersheds/6th Field HUC Descriptions

Clark Fork River – Dunkleberg Creek 6th Field Watershed

Dunkleberg Creek

Dunkleberg Creek is a tributary to the Clark Fork River and enters the drainage at approximately river mile 427.3. Land ownership in the drainage is primarily NFS lands in the upper portion of the drainage, while the lower portion of the drainage is primarily private lands along with some State of Montana school trust lands. The primary land use in the drainage is cattle grazing although some historic logging was also observed.

A riparian assessment was conducted at RM 6.2 of Dunkleberg Creek (Lindstrom et al. 2008). The creek was classified as a C channel type, and the habitat was in relatively good condition with some minor degradation observed. The degradation that was observed was primarily due to reduced densities of woody riparian vegetation throughout the reach and the absence of willows from the reach. Large woody debris was also absent from the reach and deep pools were observed infrequently. This site appeared to have been grazed heavily in the past, but was currently recovering from this disturbance. Signs of historic logging in this reach were also observed that may have impacted fish habitat at this site.

Dunkleberg Creek supports brown trout as well as a genetically pure population of westslope cutthroat trout. The Forest has previously invested in watershed improvements in Dunkleberg Creek. These improvements include riparian fencing to exclude livestock access to the stream and willow planting to enhance stream channel stability.

Clark Fork River-Perkins Creek 6th Field Watershed

Perkins Creek

Perkins Creek is a tributary to the Clark Fork River near river mile (RM) 285.3. This very small stream drains for approximately 4.7 miles out of the Flint Range before reaching its terminus near Jens. Present surface connection to the Clark Fork River is unlikely as the stream appears to be captured by an irrigation ditch (originating on the Clark Fork River) prior to reaching the river. Land ownership along Perkins Creek is comprised primarily of privately owned lands, with limited NFS land ownership in the upper extent of the watershed. Most of Perkins Creek is accessible only through private land. The primary land uses in the drainage are livestock grazing and timber harvest. Additionally, several residences/farmsteads are located along the stream close to its mouth. Electrofishing surveys conducted in Perkins Creek did not capture any fish (MFISH 2009).

Douglas Creek 6th Field Watershed

Douglas Creek

Douglas Creek is a tributary to Flint Creek and enters the drainage at approximately river mile 10.0. Mainstem Douglas Creek begins with the confluence of the North and Middle Forks of Douglas Creek, and flows for approximately 6.6 miles to its confluence with Flint Creek. Land ownership on Douglas Creek is predominately private with the exception of a small parcel of land owned by the State of Montana. The primary land use is cattle grazing, but historic mining and logging are also present in the drainage. Below the project boundary, an old reservoir existed at approximately river mile 3.0, but it appears that a new channel of Douglas Creek was constructed to flow around this old reservoir, apparently as part of the past mining reclamation that has occurred in the drainage. It is speculated this work was completed to prevent Douglas Creek from using its historic channel and floodplain, presumably due to the polluted nature of these soils. A steep culvert was placed on Douglas Creek at the end of the constructed reach to direct flow back into the historic channel below the dam and this structure is currently functioning as a fish passage barrier limiting fish in the upper stream channel on NFS lands. (Lindstrom et al 2008). Douglas Creek contains brook trout, brown trout and a population of genetically pure westslope trout.

Middle Fork Douglas Creek

Middle Fork Douglas Creek is a tributary to Douglas Creek and enters the drainage at approximately river mile 6.3. The confluence of Middle Fork Douglas Creek with North Fork Douglas Creek forms mainstem Douglas Creek. Land ownership in the Middle Fork drainage is comprised of both National Forest and private lands. Land use in the drainage is primarily cattle grazing with historic mines present throughout the drainage.

One section was electrofished on Middle Fork Douglas Creek in August 2008 (RM 0.5) (Lindstrom et al. 2008). This section was located on National Forest System land just upstream from the confluence of the South Fork Douglas Creek (RM 0.5). Westslope cutthroat trout were the only fish species sampled on this creek and suspected genetically pure as there is no record of stocking.

A riparian assessment was also completed on the Middle Fork Douglas Creek in 2008. Middle Fork Douglas Creek at this site was classified as a B channel type, and the woody riparian vegetation at this site consisted of Douglas-fir, alder, and lodgepole pine. Primary land use at this site was cattle grazing via a Forest Service grazing allotment. The stream was well-vegetated in most spots, however some cattle hoof shear and bank erosion was observed. Fine sediment was relatively abundant in the reach and is likely due to both upstream impacts and bank erosion

within the sampled reach. Overall, the width to depth ratio in this reach was low and pools were relatively abundant (Lindstrom et al. 2008).

South Fork Douglas Creek
South Fork Douglas Creek is a tributary to Middle Fork Douglas Creek and enters the drainage at approximate RM 0.3. South Fork Douglas Creek flows entirely through National Forest System lands. A grazing allotment exists on South Fork Douglas Creek, and cattle grazing was the primary land use observed in the drainage.

One section was electrofished on the South Fork Douglas Creek in August 2008. This section was located approximately 0.3 miles upstream from the confluence with Middle Fork Douglas Creek. No fish were captured at this site. It is unknown why no fish were captured as no potential migration barriers were observed downstream of this section and westslope cutthroat trout were captured in Middle Fork Douglas Creek (Lindstrom et al 2008).

A riparian assessment was also completed on the South Fork Douglas Creek in 2008. At this site, South Fork Douglas Creek was classified as a B channel type and the woody riparian vegetation consisted of Douglas-fir and alder. Bank erosion was high due to cattle hoof-shear and woody riparian vegetation was sparse due to poor recruitment and heavy browse on young woody species. However, the creek was a boulder dominated B-channel, and fish habitat remained good due to numerous boulder formed pools. Many springs feed the creek in this reach which likely keeps water temperatures low in the summer.

Gold Creek 6th Field Watershed

Gold Creek
Gold Creek is a tributary to the Clark Fork River that drains for approximately 15 miles before reaching the upper portion of the Clark Fork basin at RM 291.6. Land ownership along Gold Creek is comprised largely of private lands with some NFS lands in the upper portion of the watershed. The primary land uses in the Gold Creek drainage are hay production, cattle grazing, and timber harvest. There is also evidence of extensive historic mining activity in the watershed.

Fish surveys were completed in Gold Creek in September of 2007. The sites were located at river mile (RM) 11.1, and 13.8. At RM 11.1, the fish community was comprised entirely of westslope cutthroat trout. Like at RM 11.1, westslope cutthroat trout were the only species present at RM 13.8. However, these fish tended to be notably smaller (Lindstrom et al 2008).

A riparian assessment was completed at each site electrofished on Gold Creek in 2007. At RM 11.1 Gold Creek was classified as a Rosgen B channel type. The riparian area was dominated by a conifer overstory, with spruce and Douglas fir being most common. Alder and willows were also present, but the willows appeared to be made up of older, decadent plants with little recruitment observed. It was noted that browse pressure was evident on many of the willows that were present in the reach. Fish habitat was good in this part of Gold Creek, but lack of deep pool habitat was thought to be a somewhat limiting factor. Flow in this segment of the stream was noted as being relatively low (Lindstrom et al. 2008).

At the most upstream site sampled in Gold Creek in 2007 (RM 13.8), the channel type at the survey site was typical of a Rosgen B stream type. Riparian vegetation was dominated by a spruce and Douglas fir overstory, and a dense sedge and grass understory. Willows were in the area but very limited in abundance, and those present showed considerable browse. Additional notes from the assessment indicate the presence of nearby berms and old ditches likely associated

with historic mining activity. Fish habitat was rated as fair and was not felt to be at its potential. This was primarily due to low flow and a complete lack of large pools and deeper pocket water.

North Gold Creek
North Fork Gold Creek is a tributary to Gold Creek that drains for approximately 4 miles before entering upper Gold Creek at RM 10.1. Land ownership along North Fork Gold Creek is comprised almost exclusively of lands administered by the Forest Service. However, approximately 0.2 mile of channel at the mouth of the stream is located within a mining claim and is under private ownership. The primary land uses in the North Fork Gold Creek drainage are cattle grazing and timber harvest.

Fish surveys were completed at two sites on North Fork Gold Creek in October 2007 (Lindstrom et al. 2008) at RM 1.6 and 3.7. At RM 1.6 the fish community was comprised entirely of westslope cutthroat trout. No fish were found at RM 3.7. The upstream distribution of fish in North Fork Gold Creek was not determined.

Riparian assessments were completed at both sites electrofished on North Fork Gold Creek in 2007 (Lindstrom et al. 2008). At RM 1.6, North Fork Gold Creek exhibited characteristics of both Rosgen B and C channel types. While the riparian health within the reach was generally good, factors affecting the overall score were site-specific grazing impacts, as well as the presence of an old road crossing that left a segment of channel wide and shallow allowing mid-channel sediment delivery. Riparian vegetation was dominated by a conifer overstory with lodgepole pine and spruce most abundant. Alder was also present, but younger age-classes were lacking. Fish habitat was rated as good, but was lacking in large woody debris and deeper pools. A diversion was noted approximately 1 mile upstream of the survey reach.

At RM 3.7, North Fork Gold Creek was confined in a narrow valley, and the gradient of the stream was beginning to increase. For these reasons, the channel was classified as a Rosgen Ba stream type. No fish were captured or observed at this site. Riparian vegetation was dominated by a conifer overstory with lodgepole pine and spruce most abundant.

South Fork Gold Creek
South Fork Gold Creek is a tributary to Gold Creek that drains for approximately 3 miles before entering upper Gold Creek at RM 12.0. Land ownership along South Fork Gold Creek is a mixture of NFS administered lands and a number of private mining claims. Several lakes exist within the drainage including Gold Creek Lakes, which occur at approximately RM 1.9 on South Fork Gold Creek, and Rainbow Lake, which is located off of South Fork Gold Creek. All have historically been stocked with fish (both rainbow trout and westslope cutthroat trout); however, the most recent plant was in Rainbow Lake in 2001 (westslope cutthroat trout). The primary land uses in the South Fork Gold Creek drainage are historic mining and timber harvest, and recreation.

A fish survey was completed at one site on South Fork Gold Creek in October 2007 (Lindstrom et al. 2008). This site was located on NFS lands at RM 0.8. The fish community at this site was comprised entirely of westslope cutthroat trout. The stream at the survey site was classified as a Rosgen B channel type. Riparian vegetation was dominated by a conifer overstory, with spruce and Douglas fir the dominant species present. Alder and snowberry were also common in the understory. Fish habitat was rated as good, and was thought to be near its potential. Large woody debris, root wads and overhanging vegetation were all abundant throughout the reach. Pools however, tended to be smaller and lacked depth. Fine sediment accumulation was notable. A culvert located upstream of the section did not appear to be a fish passage concern.

Blum Creek
Blum Creek is a small (average wetted width 4 feet), first order tributary to Gold Creek with the confluence located downstream of the Forest boundary. The stream flows perennially for approximately 2.3 miles on the Forest. The average gradient for the stream is 4-6 percent. Instream habitat throughout Blum Creek is poor. Although this stream does support low numbers of cutthroat trout, no estimate of the population size was possible due to the very low numbers of adult fish. Preliminary results indicate this population of westslope cutthroat trout may be slightly hybridized with Yellowstone cutthroat trout.

Crevice Creek
Crevice Creek is a tributary to Gold Creek that drains for approximately 4.5 miles before entering middle Gold Creek at RM 6.6. Land ownership along Crevice Creek is comprised mostly of lands administered by the Beaverhead-Deerlodge NF, with the lower mile of the channel flowing through private lands at the site of a low-density subdivision. Goldberg Reservoir is a small 8-acre impoundment at the head of the drainage. However, the primary direction of flow out of this reservoir is into the Dunkelberg Creek watershed. Only a marginal connection to Crevice Creek appears to be present, and is related to high water level elevations. The primary land uses in the Crevice Creek drainage are cattle grazing and timber harvest.

Fish surveys were completed at two sites on Crevice Creek in September of 2007 (Lindstrom et al. 2008) at RM 1.8 and 4.4. The fish community at both sites was comprised entirely of westslope cutthroat trout. Fish were also observed to be present in Goldberg Reservoir.

Riparian assessments were completed for both sites electrofished on Crevice Creek in 2007 (Lindstrom et al. 2008). At RM 1.8, Crevice Creek was classified as a Rosgen B channel type. Woody vegetation at RM 1.8 was dominated by alder and spruce, with dogwood and Douglas fir also present. However, it was noted that dogwood and woody shrubs showed notable browse pressure. Cattle hoof shear was evident along the streambanks and throughout the riparian area, and noxious weeds were also fairly abundant. Fish habitat at RM 1.8 was rated as good, but was not at its potential. This was primarily because of a lack of large woody debris in the channel, as well as the absence of deep pools. Fine sediment accumulation was notable throughout the reach.

At RM 4.4, Crevice Creek continued to display characteristics of a Rosgen B channel type. Conifers, with spruce and lodgepole pine most abundant, dominated the riparian overstory. Snowberry and alder plants were also present. Grazing impacts were observed throughout the reach with hoof shear along the streambanks and low stubble height on available grasses being most notable. Fish habitat at RM 4.4 was rated as only fair and was not at its full potential. This was primarily due to the lack of deep pools, large woody debris, and grazed grasses on the stream bank that offered little overhead cover. Fine sediment accumulation was also notable at this site (Lindstrom et al. 2008).

Pikes Peak Creek 6th Field Watershed

Pikes Peak Creek
Pikes Peak Creek is a tributary to Gold Creek that drains for over 12 miles before entering lower Gold Creek at RM 2.9. Land ownership along the lower 6 miles of Pikes Peak Creek is comprised largely of private lands with some limited State of Montana ownership where it flows through lands administered by the Montana State Prison. The upper 6 miles of the stream flows exclusively though NFS administered lands. The primary land uses in the Pikes Peak Creek drainage are cattle grazing and timber harvest. There is also evidence of historic mining activity in the watershed.

A fish survey was completed at one site on Pikes Peak Creek in October 2007 (Lindstrom et al. 2008). The site was located on NFS land at RM 6.7. The fish community at this site was comprised entirely of westslope cutthroat trout.

A riparian assessment was also completed at the site electrofished on Pikes Peak Creek in 2007 (Lindstrom et al. 2008). Riparian vegetation was dominated by a conifer overstory of spruce and Douglas fir, with alder, willow and cottonwood also present. It was noted that younger age-classes of willow, alder and cottonwood were largely absent, and what was present showed evidence of heavy browse pressure. Although the channel was a relatively stable Rosgen B stream type, cattle impacts to the streambanks were also noted. Fish habitat in the reach was rated only fair due to lack of quality cover components such as deep pools and overhanging vegetation, as well as very low flow in the channel. The stream was observed to be dewatered and dry for most of its length downstream of the sample site. Larger cobbles and boulders dominated the substrate at RM 6.7, and appeared to be a possible result of historic placer mining activity in the stream channel.

Lower Flint Creek - Gird Creek 6th Field Watershed

Gird Creek

Gird Creek and its tributaries support an isolated population of genetically pure westslope cutthroat trout. They are the only fish species present in this drainage, as the stream dewaters near the lower end of the stream on private land, these barriers effectively block invasion of nonnative species. Habitat survey data was not available for Gird Creek.

Sensitive Aquatic Species

Westslope Cutthroat Trout

Sub-species Range

Westslope cutthroat trout, (WCT) inhabit streams on both sides of the continental divide. Its eastside distribution is largely in Montana in the Missouri River drainage. Historically, within the Missouri basin, the downstream distribution extended to Great Falls and included headwaters of the Judith, Milk, and Marias rivers. On the west side, the subspecies occurs in the upper Kootenai, Clark Fork, Clearwater, and Salmon rivers. It also inhabits the Spokane River above Spokane Falls and the Coeur d'Alene and St. Joe drainages.

Westslope cutthroat distribution and abundance has declined substantially. Describing current WCT distribution is complicated by an abundance of populations with varied levels of genetic purity. Shepard et al. (2002) used specific criteria to designate conservation populations. Basically they are genetically unaltered; or those which are hybridized or the genetic status is unknown, but have ecological, genetic and behavioral attributes of significance. Populations that occupy habitat likely to become part of a WCT conservation focus were also included.

Total stream-miles occupied by conservation populations are nearly even east and west of the Continental Divide, 646 on the west side and 635 on the east side. However there are 29 conservation populations west of the divide, while there are 144 populations east of the divide. Data points to notable differences between populations separated by this geographic boundary. The average stream length occupied on the west side is 22.3 miles, while it is only 4.4 miles on the east side.

Influences from nonnative trout and other factors have resulted in severely disjointed WCT distribution patterns east of the divide. While WCT conservation populations are present in a

reasonable number of sub-watersheds/6th HUCs, they have been eliminated from most mid-sized and larger streams and rivers. This leaves harsh, less productive headwater streams as their most common refuge. Even in headwaters, they are often restricted to relatively short, stream segments where fish passage barriers protect them against upstream invasion by nonnative trout.

Individual WCT are exposed to invasion by nonnative trout and unnatural competition and hybridization risks when they move below barriers, and are essentially lost to the population. Consequently, selective pressures result in the strong tendency for east-side populations to be isolated, non-migratory residents lacking the characteristics and benefits of a metapopulation. While nonnative trout have influenced WCT populations west of the continental divide in the same manner described above, the extent and magnitude of effects are greater on the east side. The percentage of sub-watersheds containing conservation populations in the Upper Clark Fork River are notably higher than those east of the divide. Further, conservation populations persist in 36 percent of the historically occupied stream-miles west of the divide and in only 8 percent of historic habitats east of the divide.

Westslope cutthroat was petitioned for listing throughout its historic range in 1997. In 2000, the USFWS found WCT “Not Warranted for Listing”. A recent lawsuit resulted in the determination being remanded to the USFWS for reevaluation. Following a new status assessment, the August 2003 finding issued in response to the amended petition, again found WCT “Not Warranted for Listing.”

Forestwide Distribution

Based on the most thorough evaluation to date, WCT historically occupied about 33,000 miles of stream in Montana. This represented about 59 percent of the range-wide distribution (Shepard et al. 2002). About 9,300 of those miles (28 percent of the statewide distribution) are in the BDNF area. WCT were broadly distributed across the Beaverhead, Big Hole, Red Rock, Madison, Ruby, Boulder, Jefferson, and Upper Clark Fork rivers and Rock Creek drainages. Our best information suggests only 10 of 433 sub-watersheds (6th field HUCs) did not historically host westslope cutthroat trout. Eastern brook trout is the most influential nonnative competitor for WCT forestwide. While the nature of the competitive advantage is not fully understood, the magnitude of the effects on WCT distribution is well known. Fish biologists are documenting that brook trout continue to invade new areas and displace cutthroat many decades after the original introduction.

Project Area Distribution

Westslope cutthroat trout occupy most of the named streams in the project area. They are the only trout species present in the Dunkleberg, Middle Fork, South Fork and North Fork of Douglas Creeks, North and South forks of Gold Creek, Blum Creek, Crevice Creek, Pikes Peak Creek and Gird Creeks. See figure 41 followed by table 84 in this section for WCT distribution in the project area.

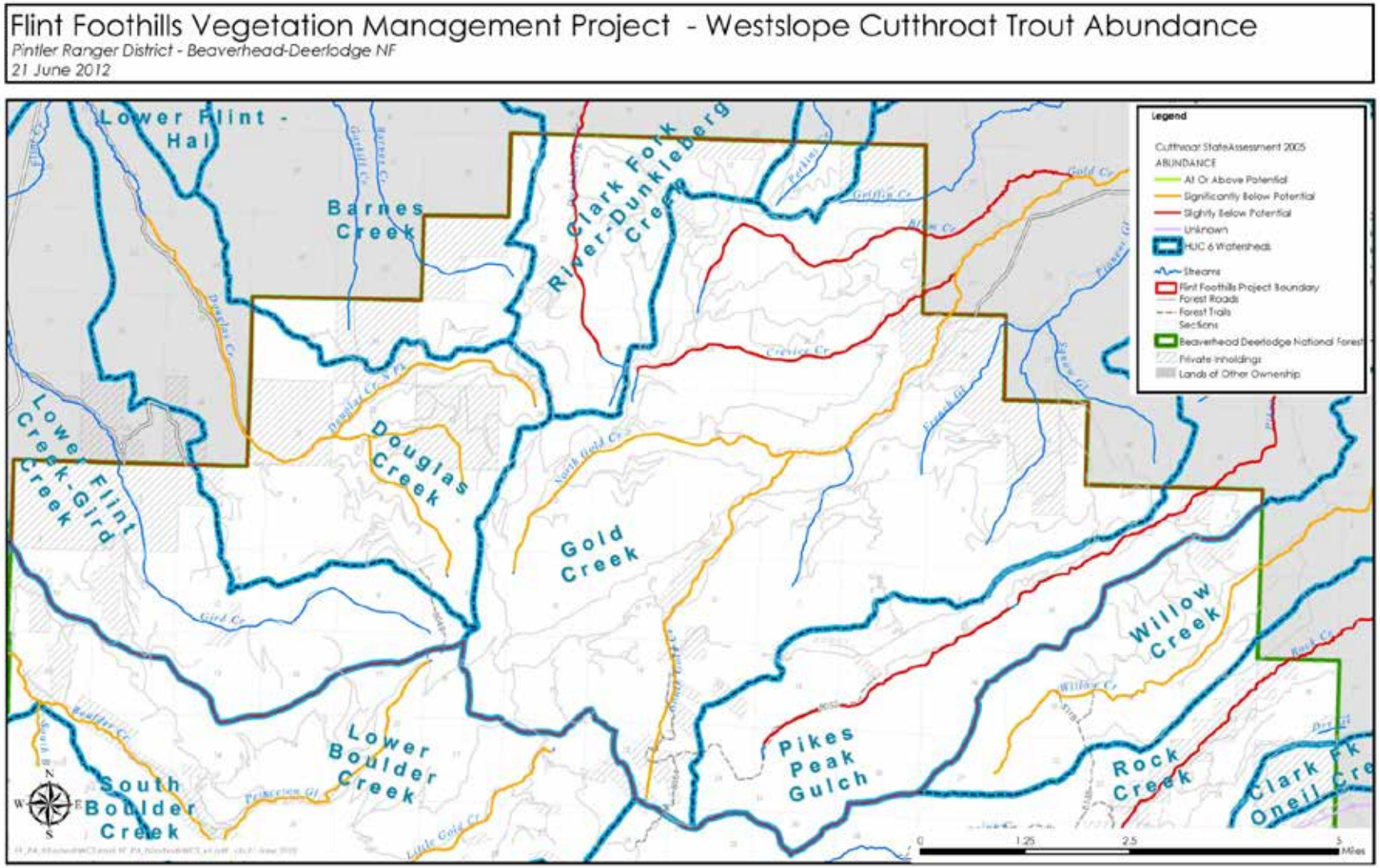


Figure 41. Westslope cutthroat trout distribution in the project area

Table 84. Fish distribution in the project area streams

Stream	River Miles	Species	Abundance
Dunkleberg Creek	6.2-11.8	westslope cutthroat trout	common
Perkins Creek	0-4.7	No fish	
Douglas Creek	0-0.6	westslope cutthroat trout	unknown
	0-1.5	brown trout	abundant
	2.4-6.4	brook trout	abundant
MF Douglas Creek	0-2.2	westslope cutthroat trout	common
SF Douglas Creek	0-2.2	westslope cutthroat trout	rare
NF Douglas Creek	0-3.1	westslope cutthroat trout	rare
Gold Creek	0-12.1	brown trout westslope cutthroat trout slimy sculpin	common
NF Gold Creek	0-4.4	westslope cutthroat trout	common
SF Gold Creek	0-1.9	westslope cutthroat trout	common
Blum Creek	0-5.5	westslope cutthroat trout	unknown
Crevice Creek	0-4.5	westslope cutthroat trout	common
Pikes Peak Creek	0-13.2	westslope cutthroat trout	common
Gird Creek	0-1.5	westslope cutthroat trout	unknown

Western Toad

The western toad is largely terrestrial and found in a variety of habitats from valley bottoms to high elevations. They breed in lakes, ponds and occasionally in slow-flowing streams. They prefer shallow areas with muddy bottoms. Breeding typically occurs from May to July, and tadpoles will metamorphose when 2 to 3 months old (Reichel and Flath 1995). Juveniles can be found in dense aggregations adjacent to breeding grounds. They are susceptible to high mortality rates if measurable disturbance occurs shortly after metamorphosis.

Adult and juvenile toads are freeze intolerant and over-winter and shelter in underground caverns, or rodent burrows (Maxell 2000). Adults feed on a variety of ground dwelling invertebrates and are known to eat smaller individuals of their own species.

Within the last 25 years, western toads have undergone population crashes in Colorado, Utah, southeast Wyoming and New Mexico (Ross et al. 1995; Corn 1998). In the northern Rocky Mountains they have also undergone declines. Surveys in the late 1990s revealed they were absent from a number of areas historically occupied. While they remain widespread across the

landscape, they appear to be occupying only 5 –10 percent, or less, of the suitable habitat (Maxell 2000).

Forestwide Distribution
A systematic inventory of standing water bodies in 50 randomly chosen sub-watersheds, on and off Forest demonstrated similar findings (Maxell 2004). Data indicates western toads are widespread across the Forest but relatively rare in occurrence (Maxell 2004). Toads were detected and breeding in only 7 percent of the suitable habitats within watersheds. What this represents with regard to historic distribution and abundance in this area is not known, since there is no baseline data to compare against. However, based on declines in other western states, it seems reasonable they are depressed and a primary cause is believed to be disease. The Montana Natural Heritage Tracker Database is the primary source for this information (MNHP 2010b).

Project Area Distribution
Surveys conducted by Maxell 2004 included the Flint Creek watershed in the project area, did not locate any western toads although suitable habitat may be present. For this reason, it is assumed they may occur in or along any of the perennial streams (or their tributaries) within the project area.

Western pearlshell mussels

Margaritifera falcata may be one of the longest living freshwater invertebrates and animals. Specimens have been aged at greater than 90 years (Vannote and Minshall 1982). The western pearlshell mussel has an elongate shell typically 2.5-4 inches long with a concave ventral edge. The interior shell has a purple to pink hue as the outside shell is dark brown to black. These mussels are found in cool, stable running, generally low to moderate gradient streams and rivers. Swift stream velocities can limit where mussels occur in streams. They are most commonly found in stable gravel and pebble benthic substrate, but can occur in sand or gravel among cobble and boulders in moderate to higher gradient larger rivers. They usually occupy reaches of stream where the riparian zone is dominated by willows or alders.

The life history of this mussel consists of four basic life stages, reproductive, larval or parasitic, juvenile and adult. The larval stage (glochidia) briefly parasitizes a host fish, most commonly westslope cutthroat trout by attaching to the gills. They fall off the host as a juvenile mussel. The larval parasitism on fish enables upstream transport to habitats otherwise difficult to reach by relatively immobile adult mussels. Western pearlshell glochidia are considered highly host specific (Bauer 1987) as they are typically restricted to salmonid fishes.

The western pearlshell mussel has experienced significant reductions in distribution over the last 100 years. A primary cause is believed to be stream habitat deterioration from high levels of fine sediment. Excess fine sediment degrades mussel habitats by decreasing substrate permeability. This has a smothering effect on juvenile mussels and limits successful recruitment (Stagliano 2010).

Because they have not been observed during past stream surveys, the Montana Natural Heritage database contains no record of occurrence for this species in the project area and because the streams tend not to provide the types of habitats they prefer it appears western Pearlshell mussels are not present, and so will not be addressed further in this analysis.

Drunella Doddsi - Management Indicator Species

Background

The mayfly, *Drunella doddsi* (DD), is an aquatic management indicator species (MIS) for the Beaverhead Deerlodge NF. It was selected because it commonly occurs in streams across the Forest; and because it is influenced by changes in water quality, including sedimentation. The analysis for the Forest Plan recognized sedimentation as an impact common to aquatic systems from land management actions, including various types of vegetation management, road construction, vehicular use of roads and trails, livestock grazing, and various types of restoration actions. High levels of fine sediment in aquatic systems are commonly synonymous with degraded habitat conditions and poor stream function. The reverse is so when fine sediment levels are low.

There are specific habitats with greater potential for hosting DD than others. Its preference is commonly for higher stream gradients with larger substrate size. It is often present in lower gradient reaches, where we commonly survey to evaluate aquatic impacts from management; but commonly in lower densities. We expect to see abundances of DD decline in moderate to low gradient reaches if fine sediment is deposition is increasing, leaving the population centralized in higher gradient areas where sediment is transported through to downstream reaches. Thus, DD is probably more quickly influenced (and changes in abundance more observable) in lower gradient reaches than in its steeper more preferred habitats.

Based on its ecology, abundances of DD should decline or increase depending on the influence land management is having on sediment introduction. As such, its abundances should indicate whether management activities are effectively maintaining and/or improving conditions for desired aquatic species.

Abundances of DD naturally vary in four ways:

- Between stream segments within the same stream depending on the quality and abundance of preferred habitats
- Between streams, depending on differences in thermal regimes and the abundance of preferred habitats
- Between different periods within the year, depending on when adult emergence occurs and when newly deposited eggs hatch and become large enough to be captured during sampling
- Between years, depending on favorability of weather and stream flow conditions for reproduction and recruitment

Thus, sampling times, locations and equipment can influence comparability of data between years. Because DD was only identified as an aquatic MIS upon completion of the Forest Plan (2009), adjustments to sampling procedures remain a possibility as we learn more about distribution and emergence patterns in streams we monitor. Any adjustments will be done with the intention to produce the most comparable data possible.

Because DD was relatively recently identified as an aquatic MIS, reliable trend information is not currently available. We have sampled and counted DD in 111 samples from 75 streams across the Forest. Densities ranged from 1 to 714 (per square meter); however it is common for them to occur in relatively low densities. In 30 percent of the samples they occurred in densities of 10 or less. Fifty-two percent of the samples had densities of 25 or less and 79 percent of the samples had densities of 100 or less.

Data on abundance is available for the North Fork Gold and the South Fork Douglas Creeks within the analysis area. We have 1 year of information for each stream. For this reason comparison of the data to determine trends in abundance is not practical at this time. Results are provided in table 85 that follows.

Table 85. *Drunella doddsi* sample results by stream

Stream	Date	Density/m^2
NF Gold Creek	7/13/07	8
SF Douglas Creek	6/13/09	12

Drunella doddsi occurs in relatively low abundances in the two streams sampled in the project area. However, inferring management effects from single samples is less than desirable and can be misleading. Interpretation of this MIS data will be more reliable when results from additional samples are available. There will be an opportunity to correlate MIS data with management actions and habitat condition trends in the future.

Our monitoring is designed to measure changes in abundance of DD over time as an indication of changing sediment levels. Effects of proposed management on this species will be assessed based on expected change in stream function. As conditions improve in streams that are not in properly functioning condition, sediment levels will decline and DD densities should increase (Brammer 2012).

Aquatic Nuisance Species

Currently, there are no aquatic nuisance species documented within or adjacent to the Flint Foothills Project area.

Species Not Carried Forward For Detailed Analysis

Bull trout (threatened), and arctic grayling and western pearshell mussel (sensitive) are not carried forward for further analysis because of lack of suitable habitat within the analysis area, distance from known locations, or lack of potential impact to the species or its habitats. Activities from the Flint Foothills Project would not have an impact on these species.

Desired Condition

Regulatory Framework

Three government agencies share responsibility for managing aquatic resources. The U.S. Fish and Wildlife Service is a regulatory agency for federally listed species that seeks to recover these species in conjunction with other agencies. The Montana Department of Fish, Wildlife and Parks (MDFWP) has primary responsibility for managing fish populations. Management of fish and amphibian habitat on National Forest System lands is largely a Forest Service responsibility. All three agencies cooperate in research and monitoring efforts.

The Beaverhead-Deerlodge National Forest must comply with several regulations regarding management of aquatic species. Both action alternatives fully comply with all regulations. The mayfly, *Drunella doddsi*, is a management indicator species for the Beaverhead Deerlodge National Forest. It was selected because it commonly occurs in streams across the Forest and because it is influenced by changes in water quality, including sedimentation.

The sensitive species analysis in this document meets the requirements for a biological evaluation as outlined in FSM 2672.42. Sensitive species are administratively designated by the Regional Forester and managed under the authority of the National Forest Management Act.

The Regional Forester has determined that westslope cutthroat trout, arctic grayling, western toad and western pearlshell mussel are sensitive species on the Beaverhead-Deerlodge National Forest. The Forest Service is required to protect their habitat and prevent population declines that would lead to listing under the Endangered Species Act (FSM 2670).

In 1999, the Regional Forester signed the "Conservation Agreement and Management Plan for Westslope Cutthroat Trout in Montana." This conservation agreement has five objectives, of which the first three are relevant to National Forest System lands. The memorandum of understanding was updated in 2007 and the Forest is still committed to the objectives described. The first objective is to protect all genetically pure populations. The second objective is to protect all populations that are only slightly introgressed (90 percent pure). The third objective is to recover cutthroat trout in several large watersheds (at least 50 miles of habitat) across the state.

The U.S. Fish and Wildlife Service listed bull trout (*Salvelinus confluentus*) as a threatened species, under the Endangered Species Act in 1998.Bull trout are not present in the analysis area and will not be addressed further in this analysis. Critical habitat was designated in 2010. Forest-wide, they are present in upper Clark Fork River. Water quality conditions have largely eliminated upper Clark Fork River as suitable habitat or as a migratory corridor and bull trout are currently rare to incidental in the river upstream of river mile 9.4, and absent from all the project area tributary streams (Montana FWP 2009).

The National Forest Management Act of 1976 - Prevents watershed conditions from being irreversibly damaged and protects streams and wetlands from detrimental impacts. Land productivity must be preserved. Fish habitat must support a minimum number of reproductive individuals and be well distributed to allow interaction between populations.

Executive Order 11988 - Directs federal agencies to provide leadership and take action on federal lands to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains. Agencies are required to avoid the direct or indirect support of development on floodplains whenever there are reasonable alternatives and evaluate the potential effects of any proposed action on floodplains.

Executive Order 11990, **as amended -** Requires federal agencies exercising statutory authority and leadership over federal lands to avoid to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands. Where practicable, direct or indirect impacts of new construction in wetlands must be avoided. Federal agencies are required to preserve and enhance the natural and beneficial values of wetlands. Other laws pertinent to watershed management of NFS lands can be found in Forest Service Manual (FSM) 2501.1.

Executive Order 13112 - Directs federal agencies whose actions may affect the status of invasive species to (1) prevent the introduction of invasive species, (2) detect and respond rapidly to and control populations of such species in a cost effective and environmentally sound manner, as appropriations allow.

Beaverhead-Deerlodge Forest Plan – This project follows direction from the Beaverhead-Deerlodge National Forest Land and Resource Management Plan (Forest Plan, USDA Forest Service (2009) including goals, standards and guides, and desired condition.

The 2009 Forest Plan includes the following desired conditions that are applicable to the project area fisheries, water quality, and riparian and aquatic ecosystems.

- Ecological processes, which affect the chemical, physical, and biological components of the aquatic and terrestrial ecosystems and fully support designated beneficial uses, are present and functioning to provide the diversity of forest, shrub land, grassland, riparian, and aquatic communities
- Conditions for self-sustaining or viable populations of native and desired nonnative plant and animal species are supported within the natural capability of the ecosystem
- Resources adversely affected by past management activities have been rehabilitated or the related public health and safety issues corrected

The 2009 Forest Plan also contains goals specific to managing aquatic resources that are applicable to the project

Stream Channels: Stream channel attributes and processes are maintained and restored to sustain natural desired riparian, wetland, and aquatic habitats and keep sediment regimes as close as possible to those with which riparian and aquatic ecosystems developed (IN 2) (USDA 2009a, pg. 13).

Floodplains: The condition of floodplains, channels and water tables are maintained and restored to dissipate floods and sustain the natural timing and variability of water levels in riparian, wetland, meadow and aquatic habitats (IN 4) (USDA 2009a, pg. 14).

Riparian Areas: Riparian habitat, species composition, and structural diversity of native and desired nonnative riparian plant communities are maintained or restored to (IN 5-6) (USDA 2009a, pg. 14):

- Provide an amount and distribution of woody debris characteristic of functioning aquatic and riparian ecosystems
- Provide adequate summer and winter thermal regulation for streams to support beneficial uses
- Provide bank stability to maintain rates of surface erosion, bank erosion, and channel migration which are characteristic of functioning aquatic and riparian ecosystems;
- Effectively trap and store sediment, build stream banks and floodplains, and promote recovery after watershed disturbance

Riparian Habitat: Habitat to support viable, well distributed populations of native and desired nonnative plant, invertebrate, and vertebrate aquatic- and riparian-dependent species are maintained or restored. Movement corridors within and between watersheds, where desired, are maintained or restored to provide aquatic-dependent species' habitat needs and maintenance of metapopulations (IN 8) (USDA 2009a, pg. 14).

Channel Integrity: Stream channel function and water quality are maintained or restored to support designated beneficial uses on all reaches through management decisions, restoration projects or Best Management Practices as outlined in the Soil & Water Conservation Practices Handbook.

Aquatic Nuisance Species: Introductions of aquatic nuisance species in riparian and aquatic habitats are prevented. Forest biologists work cooperatively with appropriate state and federal agencies, or other stakeholders to reduce or eliminate impacts, where aquatic nuisance species are adversely affecting the viability of desired aquatic species.

Roads: Roads are designed, constructed, and maintained to meet desired stream function and avoid adverse effects to native fish and sensitive aquatic species (RF 2**)** (USDA 2009a, pg. 15)**.**

Stream Crossings: Culverts, bridges, and other stream crossings can accommodate a 100-year flood, including associated bedload and debris (RF 4) (USDA 2009a, pg. 16).

Standards

Standard 2: Evaluate the risks of aquatic nuisance /exotic species introduction as part of project analysis (Scale – Project area) (USDA 2009a, pg. 18).

Standard 5: New activities within known sensitive amphibian breeding sites and natal areas during breeding and juvenile rearing periods will not cause a threat to viability or a trend toward federal listing (Scale - Breeding sites and natal areas identified at the project level) (USDA 2009a, pg. 18).

Standard 21: Provide and maintain fish passage at new, replacement, and reconstructed road crossings of existing and potential fish-bearing streams, unless barriers are determined beneficial for native fish and sensitive aquatic species conservation (RF 5**)** (USDA 2009a, pg. 20)**.**

Standard 27: Vegetation and/or fuel management prescriptions in RCAs will be for the purpose of restoring, enhancing, or protecting the physical and biological characteristics of the RCA including Riparian Management Objectives. Vegetation and/or fuel treatments, for the purpose of protecting urban interface, private property and other investment, and public safety in RCA's shall be designed so as not to prevent the attainment of desired stream function (TM 1) (USDA 2009a, pg. 21).

Environmental Consequences

Methodology

This analysis addresses effects on populations that result from:

- Effects on aquatic habitat
- Effects on individual aquatic species

Effects on species present in the Flint Foothills Project area, but not specifically addressed in this analysis, should not vary substantially from those presented below. The extent of impacts to individuals within populations should also be within the range described. This is because their behavioral tendencies and sensitivity to influence from the causative factors are not substantially different from those species analyzed.

Sediment Delivery

Roads

Estimated sediment delivered to streams from proposed road closures and culvert replacement/removals were evaluated using the Forest Service WEPP Road Erosion Predictor

model. The Hydrology section provides a discussion on p. 277 of WEPP Roads model used in the modeling process.

For the purposes of this analysis, only roads within 300 feet of perennial streams are considered to be hydrologically connected (i.e., have the potential to deliver sediment). Beyond 300 feet, any sediment that might be produced would typically be immobilized by vegetation and other ground barriers, before it reaches water. However, not all roads within 300 feet are connected.

The extent of sedimentation that occurs from roads is dependent on many factors. The potential for sediment delivery from any route is first dependent on its proximity to a stream course. As the length of road near a stream increases or as the distance between them decreases; impacts to the stream generally increase. Increased sedimentation also occurs as the number of stream crossings increase. Failure of culverts is another factor, and can occur if they have not been designed to handle high-water events. These events are not necessarily typical, but are predictable as 10- to 100-year events. A more common occurrence is “incomplete” failure, where water pools against the road prism or flows over the top of the road for an abbreviated period, causing substantial erosion and the need for repair. This is typically caused by partial or complete debris blockages at the upstream end of the culvert; or water passage limitations during common high water events.

Beyond stream proximity and the number of crossing structures, the physical characteristics of each route define the intensity, extent and location of sediment related impacts. The physical characteristics include: width, slope, drainage features, geology, soils, adjacent topography, and the capacity of crossing structures. All of these characteristics vary substantially between routes and are primary determinants of the extent of sedimentation that occurs. The aquatics report in the project record provides more detail on the factors that affect sediment delivery. This analysis expects that all newly constructed temporary roads would be obliterated and would be hydrologically disconnected within a reasonable timeframe.

Temporary Roads

Haul Routes and Road-Stream Crossings

The erosion and sediment delivery potential associated with RCA road segments and road-stream crossings on the proposed log haul routes was modeled with the Forest Service WEPP Road Erosion Predictor model (Elliot et al. 2002). The estimated sediment contributions from roads and road-stream crossings are reported in pounds per year.

Ground-based Timber Harvest

The Disturbed WEPP model was run for all timber harvest units within the Flint Foothills project area that have a moderate, high-moderate, or high risk of erosion, and included those units that have sensitive soil types and boundaries close to the RCA buffers. No sediment delivery is expected from proposed timber units (See hydrology section).

Spatial and Temporal Context for Effects Analysis

The spatial context for effects vary by issue, and range from individual streams, multiple streams occupied by the same populations, and sub-watersheds (6th -field HUCs).

The spatial context for cumulative effects consists of the analysis area boundary and includes portions of the following six 6th field HUCs: Clark Fork-Dunkleberg, Gold Creek, Douglas Creek, Pikes Peak Gulch, Clark Fork River-Perkins Creek and Lower Flint Creek-Gird Creek

HUCs (figure 39 in the Hydrology section). Perennial streams in these HUCs are numerous and listed in table 84. Small ponds and wetlands are also present within these HUCs.

The time period that direct and indirect effects from sedimentation are projected to last, is through the first major flushing flow following the cessation of the action. Across the project area, this is expected to be no more than 5 years from the time the harvest commences, and often one year from the initiation of specific treatments.

New sedimentation sources and their impacts can last a relatively short period of time if they are moderate to low in intensity and soon to be removed. Excessive sediment deposited over longer periods may take longer to pass through the system. Sediment impacts expected to be measurable in the stream beyond 3 years are considered to be long term. Those expected to be measurable less than 3 years are considered short term.

Alternative 1 – No Action

Direct and Indirect Effects

There would be no direct, indirect or cumulative effects to aquatic resources because no project activities are proposed. A description of the on-going processes is provided below for each aquatic issue, by addressing their indicators.

Issue: Change in Stream Habitat Conditions for Drunella doddsi (MIS) and other Aquatic Species

Change in stream function

Change in sediment delivery to streams: Because there would be no project activities, there would be no new road or ground-based timber harvest change in the level of sediment delivered to streams. Sedimentation levels may change due to ongoing management. Taking “no action” to address motorized roads in managed watersheds (like those in the project area) almost always results in the same or increased levels of sedimentation over time.

Changes in Miles of motorized routes in RCAs: Because there would be no project activities, there would be no change in the miles of motorized routes in RCAs.

Measure Summary: Because there would be no project activities, there would be no change in sediment delivery to streams or change in miles of motorized routes in RCAs. Thus, a change in function for any stream within the project area is not expected.

Issue Summary: Alternative 1 would fail to promote improvement in stream habitat conditions for *Drunella doddsi* (MIS) or for other aquatic populations that exist in streams. Thus, certain aquatic populations would remain at lower densities than those in streams that are functioning properly and where habitat quality and quantity are nearer potential.

Issue: Change in Pond and Wetland Habitat Conditions for Aquatic Species

Change in miles of motorized routes in RCAs: Because there would be no project activities, there would be no change in the miles of motorized routes in RCAs.

Change in sediment delivery to ponds and wetlands: Because there would be no project activities, there would be no new road or ground-based timber harvest change in the level of sediment delivered to streams. Sedimentation levels may change due to ongoing management actions. Taking “no action” to address motorized roads in managed watersheds (like those in the project area) almost always results in the same or increased levels of sedimentation over time.

Issue Summary: Alternative 1 would not result in any change in pond and wetland habitat conditions for aquatic species.

Issue: Persistence of Sensitive WCT populations within the Analysis Area

Habitat conditions for WCT occupied streams:

Change in sediment delivery to occupied WCT streams in the analysis area: Because there would be no project activities, there would be no new road related or ground-based timber harvest change in the level of sediment delivered to streams occupied by WCT. Sedimentation levels may change due to ongoing management actions. Taking "no action" to address motorized roads in managed watersheds (like those in the project area) almost always results in the same or increased levels of sedimentation over time.

Changes in Miles of motorized routes in RCAs: Because there would be no project activities, there would be no change in the miles of motorized routes in RCAs.

Measure Summary: Because there would be "no action" there would be no measure/s taken to promote change in function or sediment delivered for any WCT occupied stream within the project area that is not currently at desired conditions.

Issue Summary: Alternative 1 would not result in any change of the persistence of WCT populations within the project area.

Issue: Persistence of Sensitive Western Toad Populations within the Analysis Area

Change in sediment delivery to streams, ponds and wetlands: Because there would be no project activities, there would be no change in road related or ground-based timber harvest sediment delivery to streams ponds and wetlands. Sedimentation levels may change due to ongoing management actions. Taking "no action" to address motorized roads in managed watersheds (like those in the project area) almost always results in the same or increased levels of sedimentation over time.

Expected change in direct mortality to toads from motorized vehicles:

Change in miles of motorized routes in RCAs: Because there would be no project activities, there would be no change in the miles of motorized routes in RCAs.

Miles of Haul routes in RCAs: Because there would be no project activities, there would be no change in the miles of haul routes in RCAs.

Measure Summary: Because there would be "no action" there would be no expected change in direct mortality to toads from motorized vehicles.

Issue summary: Alternative 1 would not result in any change in the in the likelihood of western toad population persistence within the project area.

Issue: Change in distribution of Aquatic Nuisance Species (ANS) within the Analysis Area

Expected change in vectors of transport and introduction of ANS: Because there would be no project activities, there would be no expected change in vectors of transport and introduction of ANS within the project area.

Issue Summary: Alternative 1 would not result in a change in distribution of aquatic nuisance species in the analysis area.

Alternative 2 – Proposed Action

Table 86 provides measures that are used in the subsequent analysis. It displays haul route and temporary road lengths, stream crossings and proposed temporary or NFS roads in RCAs for alternative 2 for drainages with streams occupied by westslope cutthroat trout.

Table 86. Alternative 2-miles of haul routes, temporary roads, and proposed temporary or new NFS roads, and number of stream crossings within 300 feet of selected streams

Stream	Watershed (6th Field HUC)	Haul Routes (miles)	Haul Routes in RCAs (miles)	Temporary Roads Including Newly Constructed and Unauthorized Routes (miles)	Haul Route Major Stream Crossings	Proposed Temporary or New NFS Roads within 300 ft. of Streams	Notes
Dunkleberg Creek	Clark Fork River – Dunkleberg Creek	7.9	0.6	0.9	6	0.1	Temporary road has two major stream crossings in trib. to Dunkleberg Ck.
Douglas Creek Mainstem	Douglas Creek	4.8	0.0	0.7	0	0	Sediment deposits observed from 2011 flooding from road washout in N. Fk. Douglas Creek.
South Fk Douglas Creek	Douglas Creek	1.1	0.6	0.0	1	0	
Middle Fk. Douglas Creek	Douglas Creek	0.8	0.8	0.0	1	0	
North Fk. Douglas Creek	Douglas Creek	5.6	2.3	1.8	2	0	High sediment from road washout in upper watershed in 2011. Sediment deposits evident downstream.
Gold Creek Mainstem	Gold Creek	11.6	1.4	0.0	1	0	Gold Creek mainstem is located on private lands.
N. Fk. Gold Creek	Gold Creek	14.4	1.0	1.3	3	0.3	This drainage has the highest amount of new road constructed in

Stream	Watershed (6th Field HUC)	Haul Routes (miles)	Haul Routes in RCAs (miles)	Temporary Roads Including Newly Constructed and Unauthorized Routes (miles)	Haul Route Major Stream Crossings	Proposed Temporary or New NFS Roads within 300 ft. of Streams	Notes
							RCAs.
S. Fk. Gold Creek	Gold Creek	1.1	0.3	0.0	1	0	
Blum Creek	Gold Creek	9.6	0.6	1.4	4	0	High number of stream crossings, but most are not sediment sources.
Crevice Creek	Gold Creek	3.7	1.1	0.2	3	0	
Pikes Peak Creek	Pikes Peak Creek	0.0	0.0	0.0	0	0	
Gird Creek	Lower Flint Creek - Gird Creek	5.0	1.9	2.0	2	0.2	Haul road parallels Gird Creek within RCA for 1.9 miles. Temporary road parallels a tributary to Flint Creek for 0.2 miles.
Total		65.6	10.6	8.3	24	0.5	

Note- information obtained from estimates based on proposed action map

Direct and Indirect Effects

A description of the direct and indirect effects of alternative 2 is provided below for each aquatic issue, by addressing their indicators.

Issue: Change in Stream Habitat Conditions for (MIS) *Drunella doddsi* (DD) and other Aquatic Species

Changes in the quality and quantity of stream habitat conditions, is directly related to how well a stream functions. Stream function in the analysis area is primarily affected by sediment delivery and physical alterations to stream banks and floodplains. If the amount of sediment delivered to a stream increases beyond the stream's capacity to transport it, it is deposited on the stream bottom blanketing it and changes characteristics important to aquatic species. Fine sediment clogs interstitial spaces in stream substrate, restricting sub-surface water movement.

Oxygen delivery to fish eggs and removal of metabolic wastes is reduced and increased mortality to eggs results. When eggs survive, they hatch, and fry absorb their yolk-sacs. Sediment laden stream substrate also restricts movement of fry to the substrate surface, where they must begin active feeding. Entombment often occurs and mortality increases.

Substantial increases in sediment can also prevent juvenile trout from using spaces between larger, cobble sized rocks in the substrate. As pools fill, their depth and complexity decreases. The combined result is a reduction in a stream's ability to support a healthy fishery.

Amphibians also use streams, but are probably more substantially affected by changes to small lakes, ponds and wetlands. Because they typically lay eggs on submergent vegetation or on top of the substrate, sediment effects on reproductive success is less immediate than with trout. Concerns are more closely related to sediment deposition causing lakes ponds and wetlands to fill in; reducing their size and/or suitability as breeding, juvenile or adult habitats.

Mussels similarly can be negatively impacted by excess sedimentation. As a result of decreased substrate permeability, juvenile mussels can be subject to the smothering effect of silt added to stream habitats. Also, as sediment decreases the spawning success and recruitment of the mussels' salmonid hosts, can limit mussel recruitment as well.

Change in stream function

Change in sediment delivery to streams: Sediment delivery to streams occurs primarily from roads in riparian conservation areas (RCAs). WEPP models allow us to estimate sediment that may be delivered from roads. The Hydrology section provides modeled estimates of current sediment delivery from existing roads and stream crossings that would be used as haul routes, and roads that would be closed under action alternatives. It also provides modeled estimates of sediment delivery during and post implementation of alternative 2. Under existing conditions, the total WEPP modeling estimate of sediment delivered from those roads is 2,761 pounds per year. It also indicated this would decrease to 2,145 pounds per year during implementation of alternative 2, then drop to 1,459 pounds per year post implementation.

Road WEPP analysis indicates that under current traffic conditions sediment production ranged from 26 pounds per acre to 543 pounds per crossing for project road-stream crossings in the Gold Creek watershed. Comparison of before, during and after project sediment values indicates that there would be an overall decrease in sediment during and after the project from roads. This is a result of implementing sediment reducing BMP upgrades and road reconstruction for improved drainage. Placing slash windrows, or equivalent methods, at runoff points at stream crossings, this was not modeled, but would further reduce sediment both during and after the project.

Alternative 2 would construct 0.5 miles of new temporary road in RCAs, of which 0.33 miles are needed to access Unit 55c, and 0.17 to access Unit 68c. Proposed temporary roads outside of RCAs would be low-risk for delivering sediment to streams. All newly constructed temporary roads would be decommissioned by obliteration following project implementation. BMPs and project design features for temporary roads should be effective at reducing sediment amounts generated from construction of new temporary roads.

The greatest input of sediment from roads generally occurs during construction and active log haul during timber harvest. Sediment erosion and delivery is possible within 1 or 2 years after construction occurs in areas immediately adjacent to where road construction or road reconstruction activities have occurred (Luce and Black 1999, 2001), and during log haul.

Longer-term effects (over 1 year after disturbance) such as erosion and delivery of sediment would not be expected for this alternative due to improvements in road drainage and implementation of BMPs during activities and once activities are completed.

Temporary roads in RCAs generally pose one of the highest risks of contributing road-derived sediment. BMPs such as waterbars spaced at intervals to divert surface flows on temporary roads would be implemented that would substantially reduce the risk of sediment erosion and delivery to channels. Road maintenance for temporary roads would be conducted for this project. These activities would include road surface blading, dust abatement, ditch cleaning, and work on minor drainage structures.

Changes in Miles of motorized routes in RCAs: New temporary road construction would take place on 0.2 miles within RCAs for Lower Flint Creek-Gird Creek watershed, and 0.3 miles of new construction within RCAs in Gold Creek. All newly constructed temporary roads would be decommissioned by obliteration immediately following project activities. The transportation section describes actions associated with obliteration.

Measure Summary: Although some short-term water quality effects such as local erosion and sedimentation may occur immediately after temporary road construction or road maintenance, with the implementation of BMPs the amount of sediment would be reduced during and after project activities, and not be expected to modify water quality or stream function. Under alternative 2 there would be measurable long-term reductions in sedimentation (as inferred through risks associated with WEPP modeled estimates) from road related actions, realized within a few years after implementation in streams modeled. All newly constructed temporary roads would be decommissioned by obliteration immediately following project activities; therefore the increase of 0.5 miles of motorized routes in RCAs would be temporary.

Issue Summary: Although there would likely be small increases in sedimentation to some streams from temporary road construction, road maintenance and log hauling in RCAs there would be substantially greater reductions from road maintenance and BMP related improvements. In total, alternative 2 should result in notable long-term improvements in stream habitat conditions for DD and other aquatic species in the analysis area due to the overall reductions in road generated sediment. Increases in population densities of DD and other aquatic populations would be expected as instream sediment levels decrease. Although some short-term water quality effects such as local erosion and sedimentation may occur immediately after temporary road construction or road maintenance, with the implementation of BMPs the amount of sediment would be minimal, and not be expected to modify water quality or stream channel function.

Issue: Change in Pond and Wetland Habitat Conditions for Amphibian Species

Amphibian species mostly depend on pond and wetland habitats. Some also depend on streams to meet their habitat needs. Within the analysis area, ponds are limited in abundance, mostly occurring as beaver ponds. Most wetlands are narrow, linear features associated with streams and their floodplains. For this reason, stream RCAs are focus areas where there is the greatest likely-hood of effect and where the greatest changes could occur.

The types of effects to ponds relative to sediment introduction and physical alterations are similar to wetlands. Vehicle impacts along with sedimentation would mostly occur around the margins of ponds where habitat characteristics are similar to—or actually representative of—wetland conditions; with shallow water depths and emergent vegetation. With this in mind, this

analysis will focus on effects to wetlands, understanding that effects to ponds would be similar in nature.

Wetlands have the greatest potential to be impacted physically by motorized vehicles traveling through them and by sediment delivery that makes them smaller or shallower. For these reasons, the indicators chose for changes in pond and wetland habitat conditions are; the change in miles of motorized routes in RCAs and the change in sediment delivery to ponds and wetlands.

Change in miles of motorized routes in RCAs: New temporary road construction would take place on 0.2 miles of within RCAs for Lower Flint Creek-Gird Creek watershed, and 0.3 miles within RCAs in Gold Creek. All newly constructed temporary roads would be decommissioned by obliteration immediately following project activities. *Change in sediment delivery to ponds and wetlands:* For this analysis, we assume there is a direct correlation between reduction in road miles in RCAs and the potential for improvement in ponds and wetlands. No wetlands have been identified in project units, but if they are discovered these areas would be protected during logging operations by establishing RCAs or buffers around wetland features. As a result, no direct or indirect effects resulting from the project would be anticipated. Considering sediment delivery occurs at points along roads and is not continuous, the occurrence of sedimentation to ponds and wetlands is probably limited to a few occurrences in the project area. WEPP modeling **(**Hydrology section) indicates there would be some short-term water quality effects such as local erosion, and sedimentation may occur immediately after temporary road construction or road maintenance. With the implementation of BMPs there would be measurable long-term reductions in sedimentation (as inferred through risks associated with WEPP modeled estimates) from road related actions realized within a few years after implementation in streams modeled.
Measure Summary: Although some short-term water quality effects such as local erosion and sedimentation may occur immediately after temporary road construction or road maintenance, with the implementation of BMPs the amount of sediment would be reduced during and after project activities, and not be expected to modify water quality or stream function. Under alternative 2 there would be measurable long-term reductions in sedimentation (as inferred through risks associated with WEPP modeled estimates) from road related actions, realized within a few years after implementation in streams modeled. All newly constructed temporary roads would be decommissioned by obliteration immediately following project activities;; therefore the increase of 0.5 miles of motorized routes in RCAs would be temporary,

Issue Summary: For ponds or wetlands to lose their ability to function properly, they have to be severely, physically altered they lose their water table (substantial portion dries up); or have so much sediment delivered to them that they largely fill in; Across the Forest, there are numerous instances of motorized road and trail crossings in wetlands and specific sites where sediment delivery is occurring. , However, there are few if any where road or management related sediment impacts are severe enough to cause that level of alteration. Within the analysis area, there are no known ponds or wetlands that are at risk of losing their suitability as amphibian habitat.

WEPP modeling for Alternative 2 indicates there would be reductions in sedimentation during and after the project. As a result, there should not be measurable negative changes to suitable amphibian habitats.

Issue: Persistence of Sensitive WCT populations within the Analysis Area

The persistence of sensitive westslope cutthroat trout in the project area requires suitable protections against hybridization and competition from nonnative species, an adequate distribution to prevent them from being threatened by intense, isolated environmental events (flood, fire and drought), and an adequate quantity and quality of stream habitats to support abundant numbers of fish in all life stages.

The Forest Service does not manage nonnative fisheries and so cannot remove them from streams where they pose a threat to WCT. This is the responsibility of Montana Fish, Wildlife and Parks. We can influence the level of function in streams. As mentioned above, with changes in function, there is a corresponding change in habitat conditions. We can also influence fish distribution, through the removal or placement of fish passage barriers (if it will not pose a threat from nonnative trout).

Indicators used to evaluate the likely-hood of WCT populations persisting within the analysis area are:

Habitat conditions for WCT occupied Streams:

Change in sediment delivery to occupied WCT streams in the Analysis Area: WCT occupied streams include:

- Dunkleberg Creek
- Douglas Creek
- SF Douglas Creek
- MF Douglas Creek
- NF Douglas Creek
- Gold Creek
- NF Gold Creek
- SF Gold Creek
- Blum Creek
- Crevice Creek
- Pikes Peak Creek
- Gird Creek

The Hydrology report provides modeled estimates of current sediment delivery from existing roads and stream crossings that would be used as haul routes, and roads that would be closed under both action alternatives. It also provides modeled estimates of sediment delivery during and post implementation of alternative 2. Under existing conditions, the total WEPP modeling estimate of sediment delivered from those roads is 2,761 pounds per year. It also indicated this would decrease to 2145 lbs. /year during implementation of alternative 2, then drop to 1,459 pounds per year post implementation.

Project road information displayed previously in table 86 shows there are 24 major stream crossings located on haul routes. Road WEPP analysis indicates that under current traffic conditions sediment production ranged from 26 pounds per acre to 543 pounds per crossing for project road-stream crossings. Comparison of before, during and after project sediment values indicates that there would likely be an overall decrease in sediment from roads during and after the project. This is a result of implementation of road sediment reduction BMP upgrades or

road reconstruction for improved drainage. BMP effectiveness is discussed later in this document. Sediment reduction methods at road crossings would also include placing slash windrows at runoff points at stream crossings. This was not modeled, but would further reduce sediment both during and after the project.

Further reductions in long-term effects to water quality from roads under this alternative would be expected because of reductions in the length of open roads. This alternative includes closure of 3.1 miles of roads in the project area following treatments. Because closed roads generate less sediment than open roads, this reduction would reduce the amount of sediment generated and available for delivery to streams after the project is completed.

The highest risk of delivery of sediment under alternative 2 to streams would be from new road construction within RCAs, including both proposed temporary and NFS road construction, followed by drainages with the highest number of stream crossings. New road construction exposes soil and may increase erosion and sediment delivery to streams, especially when located in RCAs.

Existing haul road mileages were highest in the Gold Creek drainage, and within that drainage were highest in the North Fork Gold Creek. North Fork Gold Creek would have three major haul route-stream crossings, and 0.3 miles of new road construction within 300 feet of streams. Gold Creek drainage is probably the highest risk area for potential sediment delivery to streams overall from haul roads within the project area. Surveys in the Gold Creek 6th field noted fair habitat with notable fine sediment.

In the Gird Creek 6th field HUC alternative 2 proposes 0.2 miles of new temporary road construction that would parallel a tributary to Flint Creek for 0.2 miles; the haul road parallels Gird Creek within RCA for 1.9 miles with 2 major stream crossings.

Douglas Creek shows high sediment loads from erosion caused by flooding in 2011. Haul route mileage proposed in the Doulas 6th field is approximately 12.3 miles of which 3.7 occurs in the RCA. No new temporary roads are proposed in Douglas Creek. Surveys in Gird Creek and Douglas Creek and its forks indicate fair to good habitat for WCT.

The WEPP modeling estimate of sediment delivered from roads is the Gold Creek drainage for the existing condition is 2,761 pounds per year. It also indicated this would decrease to 2,145 lbs. /year during implementation of alternative 2, then drop to 1,459 pounds per year post implementation. This decrease in sediment input to Gold Creek from BMP maintenance to roads should show measurable decrease in sediment in the Gold Creek 6th field watershed, and therefore improvements in WCT habitat. Other watersheds in the analysis area that were not modeled should show similar decreases during and after project implementation.

Measure Summary: For drainages with stream crossings highly effective BMPs such as slash windrows, or equivalent methods, would be used to reduce the potential for sediment delivery to streams. Where construction of new roads within 300 feet of streams would occur, BMPs designed to help avoid impacts to water quality including sediment delivery to streams would be used to reduce short- and long-term impacts. Short-term risks and impacts for new road construction would be ground-disturbance and soil compaction that could lead to indirect effects such as soil erosion. Long-term impacts once roads are constructed would be potential road drainage problems.

After considering road maintenance and road improvements that would occur prior to hauling, and road closures, along with the WEPP models tendency to overestimate sediment delivery, measurable reductions in sediment delivery to streams would result in habitat improvements in the WCT occupied streams within a couple of years after implementation of alternative 2. Reducing sediment delivery would lead to improved spawning substrate and habitat conditions, WCT population density should also improve.

Changes in Miles of motorized routes in RCAs: New temporary road construction would take place on 0.2 miles of within RCAs for Lower Flint Creek-Gird Creek watershed, and 0.3 miles of new construction with RCAs in Gold Creek. All temporary roads constructed would be decommissioned by obliteration immediately following project activities.
Measure Summary: All newly constructed temporary roads would be decommissioned by obliteration immediately following project activities; therefore the increase of 0.5 miles of motorized routes in RCAs would be temporary.

Issue Summary: Alternative 2 should result in long-term improvements in stream habitat conditions for all WCT occupied streams in the analysis area. Increases in population densities of WCT would be expected. Although some short-term water quality effects such as local erosion and sedimentation may occur immediately after temporary road construction or road maintenance, with the implementation of BMPs would result in measurable long-term reductions in sediment delivery – and measurable stream habitat conditions in streams in the analysis area.

Issue: Persistence of Sensitive Western Toad Populations within the Analysis Area

Data indicates western toads are widespread across the Forest but relatively rare in occurrence. Although they have not been documented in the project area, suitable habitat is present throughout. For this reason it is assumed they may occur in or along any of the perennial streams (or their tributaries) within the project area.

Western toads commonly use stream, pond and wetland habitats. Within the analysis area, ponds are limited in abundance, mostly occurring as beaver ponds. Most wetlands are narrow, linear features associated with streams and their floodplains. For this reason, stream RCAs are focus areas where there is the greatest chance of effect and where the greatest changes could occur.

The types of effects to ponds relative to sediment introduction and physical alterations are similar to wetlands. Vehicle impacts along with sedimentation would mostly occur around the margins of ponds where habitat characteristics are similar to – or actually representative of – wetland conditions; with shallow water depths and emergent vegetation. With this in mind, this analysis will focus on effects to wetlands, assuming that effects to ponds would be similar in type and extent.

Wetlands have the greatest potential to be impacted physically by motorized vehicles traveling through them and by sediment delivery that makes them smaller or shallower. For these reasons, the indicators chosen for changes in pond and wetland habitat conditions are changes in sediment delivered to streams and wetlands; changes in direct mortality to individuals from motorized vehicles.

Change in sediment delivery to streams and wetlands: With implementation of alternative 2, WEPP modeling data in the Hydrology section provides modeled estimates of current sediment delivery from existing roads and stream crossings that would be used as haul routes, and roads

that would be closed under action alternatives. It also provides modeled estimates of sediment delivery during and post implementation of alternative 2. Under existing conditions, the total WEPP modeling estimate of sediment delivered from those roads is 2,761 pounds per year. It also indicated this would decrease to 2145 pounds per year during implementation of alternative 2, then drop to 1459 pounds per year post implementation.

Road WEPP analysis indicates that under current traffic conditions sediment production ranged from 26 pounds per acre to 543 pounds per acre for project road-stream crossings. Comparison of before, during and after project sediment values indicates that there would likely be an overall decrease in sediment during and after the project from roads. This is a result of implementation of road sediment reduction BMP upgrades or road reconstruction for improved drainage. Sediment reduction methods at road crossings would also include placing slash windrows at runoff points at stream crossings. This was not modeled, but would further reduce sediment both during and after the project.

Further reductions in long-term indirect effects to water quality from roads under this alternative would be expected because of reductions in the length of open roads. This alternative includes closure of 3.1 miles of roads in the project area following treatments. Because closed roads generate less sediment than open roads, this reduction would reduce the amount of sediment generated and available for delivery to streams after the project is completed.

Existing haul road mileages were highest in the Gold Creek drainage, and within that drainage were highest in the North Fork Gold Creek. North Fork Gold Creek would have three major haul route-stream crossings, and 0.3 miles of new road construction within 300 feet of streams. Gold Creek drainage is probably the highest risk area for potential sediment delivery to streams overall from haul roads within the project area. Surveys in the Gold Creek 6th field noted fair habitat with notable fine sediment.

In the Gird Creek 6th field HUC alternative 2 proposes 0.2 miles of new temporary road construction that would parallel a tributary to Flint Creek for 0.2 miles; the haul road parallels Gird Creek within RCA for 1.9 miles with 2 major stream crossings.

Douglas Creek shows high sediment loads from erosion caused by flooding in 2011. Haul route mileage proposed in the Doulas 6th field is approximately 12.3 miles of which 3.7 occurs in the RCA. No new temporary roads are proposed in Douglas Creek. Surveys in Gird Creek and Douglas Creek and its forks indicate fair to good instream habitat with good riparian vegetation.

The WEPP modeling estimate of sediment delivered from roads is the Gold Creek drainage for the existing condition is 2,761 pounds per year. It also indicated this would decrease to 2,145 lbs. /year during implementation of alternative 2, then drop to 1,459 pounds per year post implementation. This decrease in sediment input to Gold Creek from BMP maintenance to roads should show measurable decrease in sediment in the Gold Creek 6th field and therefore improvements in Western toad habitat. Other watersheds in the analysis area that were not modeled should show similar decreases in sediment generated by roads both during and after project implementation.

Measure Summary: For drainages with stream crossings highly effective BMPs such as slash windrows would be used to reduce the potential for sediment delivery to streams. Where construction of new roads within 300 feet of streams would occur, BMPs designed to help avoid impacts to water quality including sediment delivery to streams would be used to reduce short- and long-term impacts. Short-term risks and impacts for new road construction would be

ground-disturbance and soil compaction that could lead to indirect effects such as soil erosion. Long-term impacts once roads are constructed would be potential road drainage problems.

After considering road maintenance and road improvements that would occur prior to hauling, and road closures, along with the WEPP models tendency to overestimate sediment delivery, measurable reductions in sediment delivery to streams would result in habitat improvements in the streams within a couple of years after implementation of alternative 2. Reducing sediment delivery would lead to improved substrate and habitat conditions, Western toad population density should also improve.

Expected change in direct mortality to individuals from motorized vehicles: Notable changes in direct mortality from motorized vehicles would be related to changes in the intensity and speed of traffic near concentration areas.

Change in miles of motorized routes in RCAs: New temporary road construction would take place on 0.2 miles of within RCAs for Lower Flint Creek-Gird Creek watershed, and 0.3 miles of new construction with RCAs in Gold Creek. All newly constructed temporary roads would be decommissioned by obliteration immediately following project activities.

Miles of Haul routes in RCAs: It is possible there could be increases in the speed of vehicles traveling routes within the project area. This could result from some of the road improvements that would occur. However, it is unlikely the increases would be more than a few miles-per-hour. With the relatively low vehicle speeds common to Forest roads, we expect the change in speed to have little to no effect on the risk of vehicle related mortality. Situations that have been noted for causing mortality levels that are a concern are often associated with pavement and vehicles traveling at much higher speeds than we would see as a result of this project.

There would be increases in vehicle traffic with workers traveling to the project area and with log hauling. The time of travel would be concentrated during daylight hours, a period when vehicle mortalities to toads are much less common. Based on this, there is a small increase in the possibility of mortalities due to higher traffic levels, but the change in risk is small.

Documentation of locations and the number of individual toads killed on Forest roads for more than 5 years have noted relatively few occurrences; none of which resulted in a high number of, or even multiple mortalities. Also, we are not aware of any breeding sites that are adjacent to roads; a situation where densities of toads would be concentrated, increasing the risk of high mortalities when small toadlets are migrating away from the area.

Aquatic standard5 in the Forest Plan (Forest Plan p. 18) requires that new management activities within known sensitive amphibian breeding sites and natal areas during breeding and juvenile rearing periods will not cause a threat to population viability or a trend toward federal listing. This standard directs us to modify management actions around a newly identified breeding and/or natal area if they are causing mortalities to, or pose a threat to, high numbers of individuals. Given this direction, along with the fact that there would be little to no change in risk, and we know of no areas where mortalities are beyond incidental, we expect there would be no measurable change in the incidence of vehicle related mortality to toads. Thus, for alternative 2, vehicle related mortality to amphibians should remain at low levels and would not occur at levels that should create negative trends in populations or place populations at risk

Issue Summary: We expect there should be little to no change in the persistence of Western toad from increases in vehicle speed or vehicle traffic levels if implementing alternative 2.

There would be small short-term increases in the total miles of roads in RCAs. Vehicle related mortality to amphibians may not even occur because there are no known breeding sites along current or proposed haul routes. If mortality does occur to individuals, it would not be common enough to create negative trends in populations or place populations at risk.

There would be small increases in sedimentation on project area streams as described above, due to road construction and maintenance. During and following project implementation sedimentation would be reduced at all sites. The initial increase would not be substantial enough to cause measurable change in suitable habitat for western toads.

Thus, proposed activities in alternative 2 would not threaten the persistence of western toad within the analysis area.

Issue: Change in the Distribution of Aquatic Nuisance Species (ANS)

The actions proposed under alternative 2 are to conduct treatments to improve vegetation communities clearcut salvage, commercial thinning, seed tree harvest and precommercial thinning The proposed action treatments would be done with mechanized ground-based equipment on slopes less than 35 percent, or with cable-based logging systems on steeper slopes. Aquatic Nuisance Species (ANS) are nonindigenous plant or animal species that threaten the diversity or abundance of native and desired nonnative species and the ecological stability of the infested water. For the purposes of this analysis, the ANS are Western Milfoil, the New Zealand mud snail (NZMS), and the parasite *Myxobolus cerebralis*, which causes whirling disease. Zebra mussels are nonindigenous and can wreak havoc on native mussel populations, but have yet to be found in Montana.

Currently whirling disease has been found in over 95 bodies of water in Montana with severe infections in the Madison River; middle Missouri River near Helena, Rock Creek near Missoula, Big Blackfoot River and many smaller wild trout streams, but has not been identified in or adjacent to the project area.

The NZMS is native to New Zealand but long established in Australia and Europe. Population levels can exceed 100,000 snails per square meter. New Zealand mud snails have become established in every major river drainage in Yellowstone National Park and in the Madison River Drainage in Montana. Modes of transportation may include hitchhiking on recreational equipment and other equipment used in water, in the guts of harvested or illegally transported fish, or via transport on waterfowl and other aquatic birds. NZMS degrade habitat due to their high reproductive capacity and the subsequent impacts on invertebrate food sources. Fish receive little, if any, nutritive value from eating the snail. The snail has an operculum that it closes when threatened, which prevents digestive juices from reaching the soft tissue of the snail's body when ingested by fish.

Expected change in vectors of transport and introduction of ANS: The risk of introducing ANS into the analysis area depends on changing the likelihood for transport from infected water to unoccupied water in the analysis area. The nearest locations for 3 ANS of concern are Canyon Ferry (western milfoil), the Beaverhead River (New Zealand mudsnail) and the Clark-Fork River (whirling disease). There is nothing proposed as part of Alternative 2 that would increase the risk of transporting these species from their current locations to the project area.

There would be no change in recreational uses that would increase the potential for transporting these species from their current locations to the project area.

Issue Summary: Because there are currently no known ANS near to – or within the analysis area and this project is not expected to cause a change in pattern or type of recreational activities that could add vectors of transport and/or increase risk of introduction; There should be no change in the occurrence and/or introduction of ANS within the analysis area by implementing Alternative 2.

Alternative 3

Table 87 provides measures that are used in the subsequent analysis. It displays haul routes and temporary road lengths, stream crossings and proposed temporary or NFS roads in RCAs for alternative 3 for drainages with streams occupied by westslope cutthroat trout.

Table 87. Alternative 3-miles of haul routes, temporary roads, and proposed temporary or new NFS roads, and number of stream crossings within 300 feet of select streams

Stream	Watershed (6th Field HUC)	Haul Routes (miles)	Haul Routes in RCAs (miles)	Unauthorized Routes (miles)	Haul Route Major Stream Crossings	NFS roads within 300 ft. of streams (miles)	Notes
Dunkleberg Creek	Clark Fork River – Dunkleberg Creek	6.9	0.6	0.9	4	0	
Douglas Creek Mainstem	Douglas Creek	4.1	0.0	0.0	0	0	Sediment deposits observed from 2011 flooding from road washout in N. Fk. Douglas Creek.
South Fk Douglas Creek	Douglas Creek	1.1	0.6	0.0	1	0	
Middle Fk. Douglas Creek	Douglas Creek	0.8	0.8	0.0	1	0	
North Fk. Douglas Creek	Douglas Creek	3.8	2.3	0.0	2	0	High sediment from road washout in upper watershed in 2011. Sediment deposits evident downstream.
Gold Creek Mainstem	Gold Creek	11.6	1.4	0.0	1	0	Gold Creek mainstem is located on private lands.

Stream	Watershed (6th Field HUC)	Haul Routes (miles)	Haul Routes in RCAs (miles)	Unauthorized Routes (miles)	Haul Route Major Stream Crossings	NFS roads within 300 ft. of streams (miles)	Notes
N. Fk. Gold Creek	Gold Creek	12.2	1.0	0.0	3	0	
S. Fk. Gold Creek	Gold Creek	1.1	0.3	0.0	1	0	
Blum Creek	Gold Creek	8.2	0.6	0.8	4	0	High number of stream crossings, but most are not sediment sources.
Crevice Creek	Gold Creek	3.1	1.1	0.0	3	0	
Pikes Peak Creek	Pikes Peak Creek	0.0	0.0	0.0	0	0	
Gird Creek	Lower Flint Creek - Gird Creek	3.0	0.9	0.0	2	0	Haul road parallels Gird Creek within RCA for 0.9 miles
Total		55.9	9.6	1.7	22	0	

Direct and Indirect Effects

A description of the direct and indirect effects of alternative 3 is provided below for each aquatic issue, by addressing their indicators.

Issue: Change in Stream Habitat Conditions for *Drunella doddsi* (MIS) and other Aquatic Species

Changes in the quality and quantity of stream habitat conditions, is directly related to how well a stream functions. Stream function in the analysis area is primarily affected by sediment delivery and physical alterations to stream banks and floodplains.

Change in stream function:

Change in sediment delivery to streams: Road WEPP modeling that was done for major haul routes for alternative 2 is used for this alternative (see hydrology report). The major haul routes where sediment source assessments were done are the same for both alternatives. The potential amount of sediment delivery risk to streams from the project road system is less from this alternative than alternative 2. Sediment delivery and erosion occurring because of road maintenance and reconstruction would be less in this alternative than in alternative 2, because

there would be about 12 fewer miles of haul routes, including unauthorized routes, and no new NFS or temporary road construction.

Approximately 55.9 miles of roads within drainages occupied by westslope cutthroat trout would be utilized as haul route, of these 10.7 miles are located in RCAs with 22 road-stream crossings (table 87). However, considering BMPs would be implemented, and their demonstrated high effectiveness rates, road related sediment is expected to be reduced during and after project implementation, so sediment related water quality changes would be expected to be minimal.

Sediment delivery to streams occurs primarily from roads in riparian conservation areas (RCAs). WEPP models allow us to estimate sediment that may be delivered from roads. The Hydrology section provides modeled estimates of current sediment delivery from existing roads and stream crossings that would be used as haul routes, and roads that would be closed under action alternatives. It also provides modeled estimates of sediment delivery during and post implementation of alternative 2. Under existing conditions, the total WEPP modeling estimate of sediment delivered from those roads is 2,761 pounds per year. It also indicated this would decrease to 2,145 pounds per year during implementation of alternative 2, then drop to 1,459 pounds per year post implementation.

Road WEPP analysis indicates that under current traffic conditions sediment production ranged from 26 pounds per acre to 543 pounds per crossing for project road-stream crossings in the Gold Creek watershed. Comparison of before, during and after project sediment values indicates that there would be an overall decrease in sediment during and after the project from roads. This is a result of implementing sediment reducing BMP upgrades and road reconstruction for improved drainage. Placing slash windrows, or equivalent methods at runoff points at stream crossings was not modeled, but would further reduce sediment both during and after the project.

Long-term indirect effects to water quality from roads would be expected to be reduced compared to alternative 2 because there would be no new roads constructed and fewer miles of haul routes. Road maintenance within the RCAs for perennial and intermittent streams would be completed on 10.7 miles, improving the function of water and sediment control measures such as road crowning, condition of ditches, ditch blocks and rolling dips, and culvert function. This action would further reduce the amount of sediment being introduced into streams, as well as the amount of water from road-surface runoff.

Changes in Miles of motorized routes in RCAs: In this alternative, because no new roads are proposed, there would be no increases in the miles of motorized routes in the RCAs.

Measure Summary: Although some short-term water quality effects such as local erosion and sedimentation may occur immediately after road maintenance, with the implementation of BMPs the amount of sediment would be reduced during and after project activities, and not be expected to modify water quality or stream function. Under alternative 3 there would be measurable long-term reductions in sedimentation (as inferred through risks associated with WEPP modeled estimates) from road related actions, realized within a few years after implementation in streams modeled.

Issue Summary: Alternative 3 should result in long term improvements in stream habitat conditions for DD and other aquatic species in the analysis area due to the reductions in road generated sediment. Although some short-term water quality effects such as local erosion and sedimentation may occur immediately after road maintenance, with the implementation of BMPs the amount of sediment would be minimal, and not be expected to modify water quality

or stream channel function, so DD and other aquatic population densities should increase as instream sediment levels decrease.

Issue: Change in Pond and Wetland Habitat Conditions for Amphibian Species

Amphibian species mostly depend on pond and wetland habitats. Some also depend on streams to meet their habitat needs. Within the analysis area, ponds are limited in abundance, mostly occurring as beaver ponds. Most wetlands are narrow, linear features associated with streams and their floodplains. For this reason, stream RCAs are focus areas where there is the greatest likely-hood of effect and where the greatest changes could occur.

The types of effects to ponds relative to sediment introduction and physical alterations are similar to wetlands. Livestock and vehicle impacts along with sedimentation would mostly occur around the margins of ponds where habitat characteristics are similar to – or actually representative of – wetland conditions; with shallow water depths and emergent vegetation. With this in mind, this analysis will focus on effects to wetlands, understanding that effects to ponds would be similar in nature.

Wetlands have the greatest potential to be impacted physically by motorized vehicles traveling through them and by sediment delivery that makes them smaller or shallower. For these reasons, the indicators chose for changes in pond and wetland habitat conditions are; the change in miles of motorized routes in RCAs and the change in sediment delivery to ponds and wetlands.

Change in miles of motorized routes in RCAs: In this alternative, because no new roads are proposed, there would be no increases in the miles of motorized routes in the RCAs.

Change in sediment delivery to ponds and wetlands: Wetlands would continue to be protected by RCAs under this alternative. BMPs and resource protection measures were also selected and designed to prevent, or limit, upland sediment introduction into wetlands and streams. As in alternative 2, no wetlands have been identified in project units, but if they are discovered these areas would be protected during logging operations by establishing RCAs or buffers around wetland features. As a result no direct or indirect effects resulting from the project would be anticipated.

As in alternative 2, no commercial thinning or salvage would be conducted within RCAs. No commercial thin, seed tree harvest or salvage by clearcut harvest would be conducted within RCAs. No direct ignition would occur within RCAs or within riparian areas. In RCAs, only back burning would be allowed when soils are moist and temperatures cool. Short-term direct effects of back burning may consist of partial groundcover removal. Indirect effects such as erosion and transportation of sediment would be considered unlikely due to implementation of BMPs, prohibition of ignition within RCAs, maintenance of groundcover throughout the majority of the RCAs, and burning only when soils are moist and cool. The greatest potential for sediment reduction is associated with road maintenance and improvements that would occur prior to log hauling.

Measure Summary: Although some short-term water quality effects such as local erosion and sedimentation may occur immediately after road maintenance, with the implementation of BMPs the amount of sediment would be reduced during and after project activities, and not be expected to modify water quality or stream function. Under alternative 3 there would be measurable long-term reductions in sedimentation (as inferred through risks associated with

WEPP modeled estimates) from road related actions, realized within a few years after implementation in streams modeled.

Issue Summary: We expect there should be little to no change in the persistence of western toad from increases in vehicle speed or vehicle traffic levels if implementing alternative 3. There would not be increases in the total miles of roads in RCAs. Vehicle related mortality to amphibians may not even occur because there are no known breeding sites along current or proposed haul routes. If mortality does occur to individuals, it would not be common enough to create negative trends in populations or place populations at risk.

There would be small increases in sedimentation on project area streams as described above, due to road construction and maintenance. During and following project implementation sedimentation would be reduced at all sites. The initial increase would not be substantial enough to cause measurable change in suitable habitat for western toads.

Thus, proposed actions in alternative 3 would not threaten the persistence of western toad within the analysis area.

Issue: Persistence of Sensitive WCT populations within the Analysis Area

The persistence of sensitive westslope cutthroat trout in the project area requires suitable protections against hybridization and competition from nonnative species, an adequate distribution to prevent them from being threatened by intense, isolated environmental events (flood, fire and drought), and an adequate quantity and quality of stream habitats to support abundant numbers of fish in all life stages.

The Forest Service does not manage nonnative fisheries and so cannot remove them from streams where they pose a threat to WCT. This is the responsibility of Montana Fish, Wildlife and Parks. We can influence the level of function in streams. As mentioned above, with changes in function, there is a corresponding change in habitat conditions. We can also influence fish distribution, through the removal or placement of fish passage barriers (if it will not pose a threat from nonnative trout).

Habitat conditions for WCT occupied streams

Change in sediment delivery to occupied WCT streams in the Analysis Area: WCT occupied streams include:

- Dunkleberg Creek
- Douglas Creek
- SF Douglas Creek
- MF Douglas Creek
- NF Douglas Creek
- Gold Creek
- NF Gold Creek
- SF Gold Creek
- Blum Creek
- Crevice Creek
- Pikes Peak Creek
- Gird Creek

Road WEPP modeling that was done for major haul routes for alternative 2 is used for this alternative (see hydrology report). The major haul routes where sediment source assessments were done are the same for both alternatives. The potential amount of sediment delivery risk to streams from the project road system is less from this alternative than alternative 2. Sediment delivery and erosion occurring because of road maintenance and reconstruction would be less in this alternative than in alternative 2, because there would be about 12 fewer miles of haul routes, including unauthorized routes, and no new NFS or temporary road construction. Approximately 55.9 miles of roads would be utilized as haul routes, including 10.7 miles within the RCA along perennial and intermittent streams.

Short-term increases in turbidity and suspended sediment may occur from roads during project implementation and road maintenance. However, considering BMPs would be implemented, and their demonstrated high effectiveness rates, not all eroded sediment would be delivered to stream drainages, so sediment related water quality changes would be expected to be minimal.

Existing haul road mileages were highest in the Gold Creek drainage, and within that drainage were highest in the North Fork Gold Creek. North Fork Gold Creek would have three major haul route-stream crossings. Gold Creek drainage is probably the highest risk area for potential sediment delivery to streams overall from haul roads within the project area. Surveys in the Gold Creek 6th field noted fair habitat with notable fine sediment.

In the Gird Creek 6th field HUC alternative 3 the haul road parallels Gird Creek within RCA for 0.9 miles with 2 major stream crossings.

Douglas Creek shows high sediment loads from erosion caused by flooding in 2011. Haul route mileage proposed in the Doulas 6th field is approximately 12.3 miles of which 3.7 occurs in the RCA. Surveys in Gird Creek and Douglas Creek and its forks indicate fair to good habitat for WCT.

The WEPP modeling estimate of sediment delivered from roads is the Gold Creek drainage for the existing condition is 2,761 pounds per year. It also indicated this would decrease to 2,145 lbs./year during implementation of alternative 2, then drop to 1,459 pounds per year post implementation. This decrease in sediment input to Gold Creek from BMP maintenance to roads should show measurable decrease in sediment in the Gold Creek 6th field watershed, and therefore improvements in WCT habitat. Other watersheds in the analysis area that were not modeled should show similar decreases in sediment generated by roads, both during and after project implementation.

Measure Summary: After considering road maintenance and road improvements that would occur prior to hauling, and road closures, along with the WEPP models tendency to overestimate sediment delivery, measurable reductions in sediment delivery to streams would result in habitat improvements in the WCT occupied streams within a couple of years after implementation of alternative 2. Reducing sediment delivery would lead to improved spawning substrate and habitat conditions, WCT population density should also improve.

Long-term indirect effects to water quality from roads would be expected to be reduced compared to alternative 2 because there would be no new roads added and fewer miles of haul routes. Road maintenance within the RCAs for perennial and intermittent streams would be completed on 10.7 miles, improving the function of water and sediment control measures such as road crowning, condition of ditches, ditch blocks and rolling dips, and culvert function. This

action would further reduce the amount of sediment being introduced into streams, as well as the amount of water from road-surface runoff.

Changes in Miles of motorized routes in RCAs: In this alternative, because no new roads are proposed, there would be no increases in the miles of motorized routes in the RCAs.

Measure Summary: On existing roads, effects of maintenance would be less than alternative 2, because there would be about 12.4 fewer miles of haul routes, and no temporary road construction. BMPs would be employed to reduce sediment from all roads used in this alternative. The potential amount of sediment delivery risk to streams is less from this alternative. Reducing sediment delivery would lead to improved spawning substrate and habitat conditions, therefore WCT population density should also improve.

Issue Summary: Alternative 3 should result in long-term improvements in stream habitat conditions for WCT in the analysis area due to the decreases in road generated sediment. Increases in population densities of WCT would be expected. Although some short-term water quality effects such as local erosion and sedimentation may occur immediately road decommissioning or road maintenance, with the implementation of BMPs the amount of sediment would be reduced during and after project implementation, and not be expected to modify water quality or stream channel function.

Issue: Persistence of Sensitive Western Toad Populations within the Analysis Area

Wetlands have the greatest potential to be impacted physically by motorized vehicles traveling through them, by livestock trampling and by sediment delivery that makes them smaller or shallower. For these reasons, the indicators chosen for changes in pond and wetland habitat conditions are changes in sediment delivered to streams and wetlands; changes in direct mortality to individuals from motorized vehicles; and a change in the level of non-sediment related impacts to streams and wetlands.

Change in sediment delivery to streams, ponds and wetlands: Wetlands would continue to be protected by RCAs under this alternative. BMPs and resource protection measures were also selected and designed to prevent, or limit, upland sediment introduction into wetlands and streams. As in alternative 2, no wetlands have been identified in project units, but if they are discovered these areas would be protected during logging operations by establishing RCAs or buffers around wetland features. As a result no direct or indirect effects resulting from the project would be anticipated.

As in alternative 2, no commercial thinning or salvage would be conducted within RCAs. No commercial thin, seed tree harvest or salvage by clearcut harvest would be conducted within RCAs. No direct ignition would occur within RCAs or within riparian areas. In RCAs, only back burning would be allowed when soils are moist and temperatures cool. Short-term direct effects of back burning may consist of partial groundcover removal. Indirect effects such as erosion and transportation of sediment would be considered unlikely due to implementation of BMPs, prohibition of ignition within RCAs, maintenance of groundcover throughout the majority of the RCAs, and burning only when soils are moist and cool. The greatest potential for sediment reduction is probably associated with road maintenance and improvements that would occur prior to log hauling.

Ponds and wetlands represent only a fraction of area instream RCAs in the project area. Considering sediment delivery occurs at points along roads and is not continuous, the occurrence of sedimentation to ponds and wetlands is probably limited to a few occurrences in

the project area. There is also potential for sediment reduction associated with road maintenance and improvements that would occur prior to log hauling. For this analysis, we assume there would probably be a small change in sediment delivery to ponds and wetlands. However, it is doubtful the change would substantially change wetland conditions to any measurable extent.

Existing haul road mileages were highest in the Gold Creek drainage, and within that drainage were highest in the North Fork Gold Creek. North Fork Gold Creek would have three major haul route-stream crossings. Gold Creek drainage is probably the highest risk area for potential sediment delivery to streams overall from haul roads within the project area. Surveys in the Gold Creek 6th field indicate fair habitat with notable fine sediment.

In the Gird Creek 6th field HUC alternative 3 proposes the haul road parallels Gird Creek within RCA for 0.9 miles with 2 major stream crossings.

Douglas Creek shows high sediment loads from erosion caused by flooding in 2011. Haul route mileage proposed in the Doulas 6th field is approximately 12.3 miles of which 3.7 occurs in the RCA. Surveys in Gird Creek and Douglas Creek and its forks indicate fair to good instream habitat with good riparian vegetation.

The WEPP modeling estimate of sediment delivered from roads is the Gold Creek drainage for the existing condition is 2,761 pounds per year. It also indicated this would decrease to 2,145 lbs. /year during implementation of alternative 2, then drop to 1,459 pounds per year post implementation. This decrease in sediment input to Gold Creek from BMP maintenance to roads should show measurable decrease in sediment in the Gold Creek 6th field watershed, and therefore improvements in Western toad habitat. Other watersheds in the analysis area that were not modeled should show similar decreases in sediment generated by roads both during and after project implementation.

Measure Summary: For wetlands to lose their ability to function properly, they have to be severely, physically altered or have so much sediment delivered to them that they largely fill in. Modeling indicates there would be overall decrease in sediment from roads both during and after project implementation.

Expected change in direct mortality to toads from motorized vehicles: Notable changes in direct mortality from motorized vehicles would be related to changes in the intensity and speed of traffic near concentration areas.

Change in miles of motorized routes in RCAs: In this alternative, because no new roads are proposed, there would be no increases in the miles of motorized routes in the RCAs. No new stream crossings are required under this alternative.

Miles of Haul routes in RCAs: It is possible there could be increases in the speed of vehicles traveling routes within the project area. This could result from some of the road improvements that would occur. However, it is unlikely the increases would be more than a few miles-per-hour. With the relatively low vehicle speeds common to Forest roads, we expect the change in speed to have little to no effect on the risk of vehicle related mortality. Situations that have been noted for causing mortality levels that are a concern are often associated with pavement and vehicles traveling at much higher speeds than we would see as a result of this project.

There would be increases in vehicle traffic with workers traveling to the project area and with log hauling. The time of travel would be concentrated during daylight hours, a period when

vehicle mortalities to toads are much less common. Based on this, there is a small increase in the possibility of mortalities due to higher traffic levels, but the change in risk is small.

There are no known breeding sites near existing roads. The estimated increase in daytime traffic from logging trucks is relatively insubstantial and it should not coincide with night-time hours or wet periods when toads are more likely to migrate. Thus, for alternative 3, vehicle related mortality to amphibians should remain at low levels and would not occur at levels that should create negative trends in populations or place populations at risk.

Aquatic standard 5 in the Forest Plan (Forest Plan, p. 18) requires that new management activities within known sensitive amphibian breeding sites and natal areas during breeding and juvenile rearing periods will not cause a threat to population viability or a trend toward federal listing. This standard directs us to modify management actions around a newly identified breeding and/or natal area if they are causing mortalities to, or pose a threat to, high numbers of individuals. Given this direction, along with the fact that there would be little to no change in risk, and we know of no areas where mortalities are beyond incidental, we expect there would be no measurable change in the incidence of vehicle related mortality to toads.

Issue Summary: We expect there should be little to no change in the persistence of Western toad from increases in vehicle speed or vehicle traffic levels if implementing alternative 3. There would not be increases in the total miles of roads in RCAs. Vehicle related mortality to amphibians may not even occur because there are no known breeding sites along current or proposed haul routes. If mortality does occur to individuals, it would not be common enough to create negative trends in populations or place populations at risk.

There would be small increases in sedimentation on project area streams as described above, due to road construction and maintenance. During and following project implementation sedimentation would be reduced at all sites. The initial increase would not be substantial enough to cause measurable change in suitable habitat for western toads.

Thus, proposed actions in Alternative 3 would not threaten the persistence of western toad within the analysis area.

Issue: Change in distribution of Aquatic Nuisance Species (ANS)

The actions proposed under alternative 3 are to conduct treatments to improve vegetation communities clearcut salvage, commercial thinning, seed tree harvest and pre-commercial thinning The proposed action treatments would be done with mechanized ground-based equipment on slopes less than 35 percent, or with cable-based logging systems on steeper slopes. Aquatic Nuisance Species (ANS) are nonindigenous plant or animal species that threaten the diversity or abundance of native and desired nonnative species and the ecological stability of the infested water. For the purposes of this analysis, the ANS that will be considered are the New Zealand mud snail (NZMS) and the parasite *Myxobolus cerebralis*, which causes whirling disease. Zebra mussels are nonindigenous and can wreak havoc on native mussel populations, but have yet to be found in Montana.

Currently whirling disease has been found in over 95 bodies of water in Montana with severe infections in the Madison River; middle Missouri River near Helena, Rock Creek near Missoula, Big Blackfoot River and many smaller wild trout streams, but has not been identified in or adjacent to the project area.

The NZMS is native to New Zealand but long established in Australia and Europe. Population levels can exceed 100,000 snails per square meter. New Zealand mud snails have become established in every major river drainage in Yellowstone National Park and in the Madison River Drainage in Montana. Modes of transportation may include hitchhiking on recreational equipment and other equipment used in water, in the guts of harvested or illegally transported fish, or via transport on waterfowl and other aquatic birds. NZMS degrade habitat due to their high reproductive capacity and the subsequent impacts on invertebrate food sources. Fish receive little, if any, nutritive value from eating the snail. The snail has an operculum that it closes when threatened, which prevents digestive juices from reaching the soft tissue of the snail's body when ingested by fish.

Expected change in vectors of transport and introduction of ANS: The risk of introducing ANS into the analysis area depends on changing the likelihood for transport from infected water to unoccupied water in the analysis area. The nearest locations for 3 ANS of concern are Canyon Ferry (western milfoil), the Beaverhead River (New Zealand mudsnail) and the Clark-Fork River (whirling disease). There is nothing proposed as part of alternative 2 that would increase the risk of transporting these species from their current locations to the project area.

There would be no change in recreational uses that would increase the potential for transporting these species from their current locations to the project area.

Issue Summary: Because there are currently no known ANS near to – or within the analysis area and this project is not expected to cause a change in pattern or type of recreational activities that could add vectors of transport and/or increase risk of introduction; There should be no change in the occurrence and/or introduction of ANS within the analysis area by implementing Alternative 3.

Cumulative Effects for All Alternatives

The table that follows summarizes those actions with the greatest potential for measurable effects to *Drunella doddsi* (DD) and other aquatic species. The effects of past actions are reflected in the existing conditions described above.

Table 88. List of past present and reasonably foreseeable actions likely to currently, or in the future, affect *Drunella doddsi* and other aquatic populations, with a rating of influence on those populations

Activity	Past	Present	Reasonably Foreseeable in Future	Currently Measurable Effect	Positive	Negative
Livestock grazing	x	x	x	Substantial		x
Irrigation diversion	x	x	x	Moderate		x
Invasive plant species treatment	x	x	x	Little	x	
Mining	x			Minor		x
Dispersed recreation	x	x	x	Little		x
Roads and trails	x	x	x	Moderate-Substantial		x
Hazard tree removal		x		Little-None		x

- **Livestock grazing:** This affects DD and other aquatic populations because it alters stream morphology and vegetative conditions in the uplands and riparian areas. This causes increases in sedimentation and ultimately increased levels of fine sediment in the stream substrates where DD lives.
- **Irrigation diversion:** Irrigation diversion effects on DD and other aquatic populations occur through the loss of instream flows and possibly temperature increases. The effects are probably low to moderate because most extensive and dramatic diversions occurs downstream of Forest lands.
- I**nvasive plant species treatment**: Beneficial effects are expected from reversing trends in vegetative conditions. These are potential negative effects if herbicides contact individuals directly. The risk is low for this; the BDNF Noxious Weed EIS provides mitigations to reduce risks of introduction of herbicide into streams and other water bodies. We expect the balance of effects related to this management to be beneficial.
- **Mining:** Historic mining has had minor effects on water quality and stream function in the project area, but there is no known water quality or stream channel conditions caused by historic mining that would be affected by the proposed activities. Placer operations have altered the physical function of some stream channels through the removal of stream gravels.
- **Dispersed recreation:** This is common across the analysis area and will continue – and probably increase – in the future. Effects to DD and other aquatic populations are likely minor. Even though most dispersed camping and other activities occur in close proximity to water, the length of streams disturbed is relatively small. Sediment delivery from dispersed recreation can occur but it is limited enough in scope in most cases to keep it from being a notable concern relative to DD populations.
- **Road construction and maintenance:** alternative 2 proposes approximately 8.5 miles of new temporary roads would be constructed for haul of which 0.5 is located in RCA. No roads are proposed under alternative 3; only existing roads would be used to transport logs and forest products from the removal treatment units to main arterial roads. Required maintenance on roads for the project would reduce sources of sedimentation that are negatively affecting DD.
- **Hazard tree removal:** This is limited to certain road and trail corridors and recreation sites. Effects to DD and other aquatic populations are likely minor

Alternative 1 (no action) would not promote any change in existing conditions within the analysis area. Because many streams are currently nonfunctioning or functioning at risk, alternative 1, when considered with other current, past and reasonably foreseeable actions would result in DD and other aquatic populations persisting at depressed levels.

Alternatives 2 and 3 would promote improvement in road conditions and therefore positive trends in stream function across the analysis area. The effects of Flint Foothills proposed actions when considered cumulatively with other past, present and reasonably foreseeable actions should promote the attainment of properly functioning conditions (PFC) in aquatic habitats. Decreases in abundance or distribution of DD and other populations should not occur. As stream conditions to move toward PFC fine sediment levels in stream bottoms will decrease and DD and other populations should expand; provided other natural climatic inhibitors allow it. The table below summarizes those actions with the greatest potential for measurable effects to WCT populations. The effects of past actions are reflected in the existing conditions described above.

Table 89. List of past present and reasonably foreseeable actions that are most likely to currently, or in the future, influence WCT abundance, distribution and possibly persistence of populations

Activity	Past	Present	Reasonably Foreseeable in Future	Currently Measurable Effect	Positive	Negative
Livestock grazing	x	x	x	substantial		x
Irrigation diversion	x	x	x	Minor	x	
Invasive plant species treatment	x	x	x	little	x	
Mining	x			Minor		x
Dispersed recreation	x	x	x	little		x
Prescribed burning	x	x		minor - none	x	
Range improvements		x	x	minor	x	
Roads and trails	x	x	x	Mod - Subst		x
Hazard tree removal	x	x		little – none		x

- **Livestock grazing:** This affects WCT because it alters stream morphology and vegetative conditions in the uplands and riparian areas. This changes the capabilities of hydrologic processes and stream morphology changes, reducing stream function. The result is a reduction and simplification in habitats needed by cutthroat trout.
- **Irrigation diversions:** The effects on WCT occur through the loss of instream flows and possibly temperature increases and loss of individuals in irrigation ditches. The effects on WCT are low because most streams with conservation populations of cutthroat are diverted below the populations' distribution. In some cases, diversion is benefiting WCT because it is limiting upstream movement of nonnative species that would hybridize and/or compete with them.
- **Invasive plant species treatment:** Beneficial effects are expected from reversing trends in vegetative conditions. Potential negative effects if herbicides contact individuals directly. Risk is low for this; the BDNF Noxious Weed EIS provides mitigations to reduce risks of introduction of herbicide into streams and other water bodies. We expect the balance of effects related to this management to be beneficial.
- **Mining:** Historic mining has had minor effects to water quality and stream function in the project area, but there are no known water quality or stream channel conditions caused by historic mining that would be affected by the proposed activities. Placer operations have altered the physical function of some stream channels through the removal of stream gravels. No mining operations are proposed or ongoing at this time.
- **Dispersed recreation:** This is common across the analysis area and will continue – and probably increase – in the future. Effects to WCT are likely minor. Even though most dispersed camping and other activities occur in close proximity to water, the length of streams disturbed is relatively small. Sediment delivery from dispersed recreation can occur but it is limited enough in scope in most cases to keep it from being a notable concern relative to WCT populations. Angling probably results in a limited amount of mortality, even though state regulations prohibit anglers from keeping WCT from streams in the analysis area.
- **Prescribed burning:** This has some risk of increasing short term sediment delivery because of the temporary loss of vegetative cover that occurs. This, however, is effectively mitigated in most situations through the application of treatment buffers around streams and

other water bodies. Benefits occur through longer-term improved vegetation cover in riparian and uplands, which would reduce sediment delivery.

- **Range improvements:** These are expected to help with livestock distribution, decreasing impacts to streams, and so limiting negative effects on stream channel morphology and stream function.
- **Road construction and maintenance:** No new road construction is proposed under alternative 3; only existing roads would be used to transport logs and forest products from the removal treatment units to main arterial roads. Required maintenance on roads for the project would reduce sources of sedimentation that are negatively affecting WCT.
- **Hazard tree removal:** This is limited to certain road and trail corridors and recreation sites. Effects to DD and other aquatic populations are likely minor.

Alternative 1 (no action) would not promote any change in existing conditions within the analysis area. While this alternative meets the Forest Plan direction of “no measurable effect”, it does nothing to help ensure movement toward desired conditions. Because many streams are currently nonfunctioning or functioning at risk, alternative 1, when considered with other current, past and reasonably foreseeable actions could work cumulatively with the management activities/natural events discussed above to limit the potential to achieve healthy population densities in certain populations.

Alternatives 2 and 3 would promote improvement in stream conditions through long term reductions in sediment delivery and physical impacts to stream channels. They would promote positive shifts in stream function across the analysis area and promote increases in distribution of WCT. In this light, the effects of the Flint Foothills proposed actions when considered cumulatively with other past, present and reasonably foreseeable actions should promote the attainment better habitat conditions, and more abundant and resilient WCT populations.

Table 90 that follows summarizes those actions with the greatest potential for measurable effects on western toads and other amphibians. The effects of past actions are reflected in the existing conditions described above.

Table 90. List of past present and reasonably foreseeable actions that are most likely to currently – or in the future – affect western toads and other amphibians

Activity	Past	Present	Reasonably Foreseeable in Future	Currently Measurable Effect	Positive	Negative
Livestock grazing	x	x	x	minor	x	x
Irrigation diversion	x	x	x	minor - mod		x
Invasive plant species treatment	x	x	x	minor - none	x	
Mining	x			minor		x
Dispersed recreation	x	x	x	moderate		x
Prescribed burning	x	x		minor - none	x	
Range improvements		x	x	minor	x	
Roads and trails	x	x	x	moderate		x

- **Livestock grazing:** This affects toads and other amphibians, because it alters stream morphology and vegetative conditions in the uplands and riparian areas. Changes related to grazing tend to be inherently negative. Maxell (2000), however, indicated that toads tend to prefer areas with some level of disturbance; and livestock alteration, if not excessive, may function as a benefit for this species.
- **Irrigation diversion:** The effects on toads and other amphibians occur through the loss of instream flows. The effects on toads is probably low to moderate because they are mobile and can select where they want to become established and the most extensive and dramatic diversions occurs downstream of national forest lands.
- **Invasive plant species treatment:** This provides beneficial effects from reversing trends in vegetative conditions. Potential negative effects can occur if herbicides contact individuals directly. Risk is low for this; the BDNF Noxious Weed EIS provides mitigations to reduce risks of this to an acceptable level. We expect the balance of effects related to this management to be beneficial.
- **Mining:** Historic mining has had minor effects to water quality and stream function in the project area, but there are no known water quality or stream channel conditions caused by historic mining that would be affected by the proposed activities. Placer operations have altered the physical function of some stream channels through the removal of stream gravels. No mining operations are proposed or on-going at this time.
- **Dispersed recreation:** This is common across the analysis area and will continue – and probably increase – in the future. Effects to toads and other amphibians is likely moderate, because of the attraction of water for recreationists and the opportunity for them to find and capture individuals and disturb riparian habitats.
- **Prescribed burning:** This has some risk of influencing individuals directly during the action, however we expect toads would move during implementation. Benefits occur through improved vegetation cover in riparian areas and uplands.
- **Range improvements:** These are expected to help with livestock distribution, decreasing impacts to streams, ponds and wetlands.
- **Roads:** No road construction is proposed under alternative 3; only existing roads would be used to transport logs and forest products from the removal treatment units to main arterial roads. Required maintenance on roads for the project would reduce sources of sedimentation that are negatively affecting amphibians.

Our data indicate that western toads are limited in their distribution within the analysis area. Their occurrence is not substantially different than other places on the Forest and the belief is that disease, not habitat, is limiting them. Constraints unrelated to habitat quality and availability and their spotty occurrence helps limit their exposure to the management actions proposed. Non-the-less all of the alternatives should allow recovery of stream, wetland and riparian areas.

Summary of Effects

Alternative 1 (no action) would not promote any change in existing conditions within the analysis area. Because many streams are currently nonfunctioning or functioning at risk, alternative 1, when considered with other current, past and reasonably foreseeable actions could limit the occurrence of some improvements in wetland conditions.

Alternatives 2 and 3 would promote improvement in stream conditions and positive shifts in stream function across the analysis area. The effects of proposed actions when considered cumulatively with other past, present and reasonably foreseeable actions should promote the

attainment of properly functioning conditions in stream habitats. Some improvements in wetland conditions could occur. Benefits of these changes to toad and amphibian populations may not be observable. Decreases in abundance or distribution toads and other amphibian populations should not occur. Rather, we expect populations to remain stable provided climate and other environmental conditions allow it.

Table 91. Summary of how each alternative meets or influences the aquatic issues/concerns used for this analysis.

Aquatic Issues/Concerns	Alternative 1 Effects	Alternative 2 Effects	Alternative 3 Effects
Change in habitat for *Drunella doddsi* (MIS) and other aquatic species	No Change	Positive change	Greatest positive change
Change in pond and wetland conditions for amphibian species	No Change	Limited positive change	Limited positive change
Effect on WCT persistence	No Change	Positive	Greatest positive change
Effect on sensitive western toad persistence	No Change	No measurable change	No measurable change
Effect on aquatic nuisance species distribution in analysis area	No Change	No change	No change

Table 92. Analysis area species and summary of effects

Species	Species Status	Present In Action Area: Habitat or Detections	Effects Determination	Rationale for Determination
Fishes				
westslope cutthroat trout (*Oncorhynchus clarki lewsi*),	USFS Sensitive	Yes, Habitat and Detections	May impact, not likely to result in trend toward federal listing	Minor effects possible (e.g., short term fine sediment increase)
Amphibians				
western toad (*Bufo boreas*)	USFS Sensitive	Yes, Habitat and Detections	May impact, not likely to result in trend toward federal listing	Individual animals may be affected on haul routes.
Invertebrates				

Sensitive Species Determinations

Threatened species bull trout, sensitive species arctic grayling and western pearlshell mussels are absent from the analysis area. Thus the determination for these species is: No Impact.

The Biological Effects Determination for westslope cutthroat trout and western toad, if implementing alternatives 2 or 3 is: May Impact Individuals or Habitat, but will not likely contribute to a trend toward Federal Listing or Loss of Viability to the Population or Species.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternatives 2 and 3 meet the aquatic requirements of the Forest Plan and promote attainment of desired aquatic conditions the Plan encourages. The aquatics report in the project file describes how the action alternatives meet the relevant aquatic standards. These alternatives are consistent with viability requirements in the 1982 Forest Planning regulations, and with other relevant laws, regulations, policies and plans.

Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout and Yellowstone Cutthroat Trout

In 2007, the *Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout and Yellowstone Cutthroat Trout* was co-signed by numerous partners, including the Regional Forester (MCTSC 2007). The agreement includes the following goals.

- Ensure the long-term, self-sustaining persistence of each subspecies distributed across their historical ranges as identified in recent status reviews;
- Maintain the genetic integrity and diversity of non-introgressed populations, as well as the diversity of life histories, represented by remaining cutthroat trout populations; and
- Protect the ecological, recreational, and economic values associated with each subspecies.

A primary objective of the Montana cutthroat trout conservation agreement is to maintain, secure, and/or enhance all cutthroat trout populations designated as conservation populations, especially the genetically pure core conservation populations. The proposed project Alternatives 2 and 3 would not alter any instream channel or population connectivity therefore it is in compliance with the MOU.

Range Resources

Introduction

This section analyzes the impact of implementing the project on livestock grazing resources within the project area. The analysis will focus on National Forest System (NFS) lands within the boundaries of the project area. A specific emphasis will be placed on activity areas where vegetation treatment and road construction are being proposed.

Overview of Issues Addressed

Treatment activities can damage range allotment infrastructure, such as stock water systems and allotment boundary or pasture fences. Treatment activities may also remove natural barriers between allotments or pastures, allowing unrestricted livestock movement.

Measurement Indicators

The measurement indicators used to evaluate impacts of alternatives:

- Proposed treatment units that could potentially damage existing infrastructure.
- Proposed treatment units with the potential to remove natural barriers.

Affected Environment

Existing Condition

The history of grazing use throughout the project area is typical of most grazing areas in southwest Montana. Livestock grazing began in the mid-1800s, prior to the creation of the National Forest Reserves. Present allotments in the analysis area include Boulder Creek, Gird Creek, Hall, Blum Gold, and Willow Creek. These five allotments are managed by the Pintler Ranger District. Each allotment contains range improvements such as fences and water developments (figure 42). A brief description of each allotment within the project area follows.

Boulder Creek Allotment

The Boulder Creek Allotment consists of approximately 14,166 acres, and 129 cow/calf pairs are currently permitted on this allotment from June 21 through September 30. An allotment management plan (AMP) was prepared and approved for this allotment in January 2000. The AMP contains riparian mitigation measures as well as riparian and upland use parameters (e.g., stubble height, bank disturbance, browse utilization, grass/forb utilization). A modified four-pasture (Princeton, Cow Camp, Maywood, and Pickett Gulch) rest-rotation grazing system is used to guide livestock management (described in the annual operating plan).

Gird Creek Allotment

The Gird Creek Allotment consists of approximately 3,438 acres, and 27 cow/calf pairs are currently permitted on this allotment from June 21 through September 30. An allotment management plan (AMP) was prepared and approved for this allotment in October 1999. The AMP contains riparian mitigation measures as well as riparian and upland use parameters (e.g., stubble height, bank disturbance, browse utilization, grass/forb utilization). A two-pasture (Morrison’s and Boomer’s) deferred-rotation grazing system is used to guide livestock management (described in the annual operating plan). However, pasture containment is sometimes difficult due to the lack of fencing within the allotment. Therefore, riding and salting is used to improve livestock management.

Hall Allotment

The Hall Allotment consists of approximately 10,858 acres and 172 cow/calf pairs are currently permitted on this allotment from June 23 through October 7. An analysis was completed for this allotment in 1996. The AMP contains riparian mitigation measures as well as riparian and upland use parameters (e.g., stubble height, bank disturbance, browse utilization, grass/forb utilization). A three-pasture (Douglas Mountain, Dunkleberg, and South Fork) deferred-rotation grazing system is used to guide livestock management (described in the annual operating plan).

Blum Gold Allotment

The Blum Gold Allotment consists of approximately 7,379 acres and 124 cow/calf pairs are currently permitted on this allotment from July 1 through September 30. An analysis for this allotment was completed in November 2001. The AMP contains riparian mitigation measures as well as riparian and upland use parameters (e.g., stubble height, bank disturbance, browse utilization, grass/forb utilization). A four-pasture (Crevice Creek, North Blum, South Blum, and North Gold) rest-rotation grazing system is used to guide livestock management and described in the annual operating plan.

Willow Creek Allotment

The Willow Creek Allotment consists of approximately 8,491 acres and 260 cow/calf pairs are currently permitted on this allotment from June 16 through September 30; however, full nonuse was authorized for the 2011 grazing season. An analysis for this allotment was completed in November 2001. The AMP contains riparian mitigation measures as well as riparian and upland use parameters (e.g., stubble height, bank disturbance, browse utilization, grass/forb utilization). A three-pasture (Doney Lake, Ballard Hill, and North Willow) deferred-rotation grazing system is used to guide livestock management (described in the annual operating plan). A mix of sagebrush/grasslands, grasslands, mountain meadows, riparian areas, and forested rangelands provide the grazing capacity at all elevation zones within these allotments. All of these allotments are currently active and are grazed annually in accordance with direction found in the current Allotment Management Plan (AMP) for each allotment.

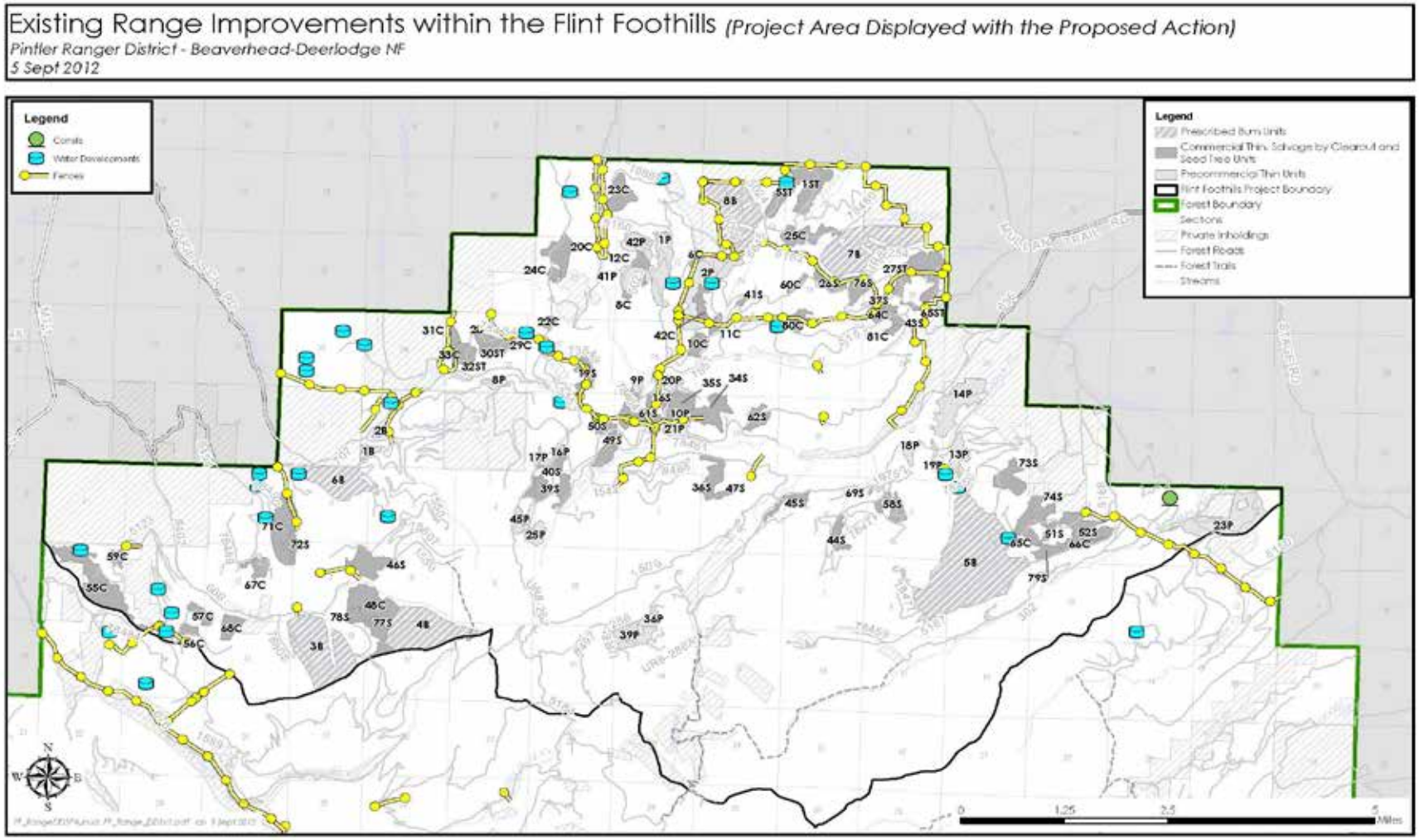


Figure 42. Existing Range Improvements within Flint Foothills, shown with the proposed action

Desired Condition

According to the 2009 Beaverhead-Deerlodge National Forest Land and Resource Management Plan (LRMP) or Forest Plan, the following applicable Forestwide goals have been identified for livestock grazing:

- Sustainable grazing opportunities are provided for domestic livestock from lands suitable for forage production (Forest Plan, p. 25); and
- Use of forage by domestic livestock will maintain or enhance the desired structure and diversity of plant communities on grasslands, shrub lands, and forests. Use will be managed to maintain or restore riparian function as defined in the allotment management plan (Forest Plan, p. 25).

The Forest Service provides standards and guidelines for rangeland use by livestock grazing operations in the Forest Plan (USDA Forest Service 2009). These stipulations apply unless or until specific long-term objectives, prescriptions, or allowable use levels have been designed through individual resource management plans or site-specific NEPA decisions (e.g., revised AMPs). All of the allotments associated with the project area have current management plans.

Environmental Consequences

Methodology

Grazing allotment boundaries and improvements within the analysis area have been mapped and potential effects within the allotments are based on their association and proximity to treatment units. Effects to grazing are primarily the potential of proposed activities to damage existing infrastructure within the allotments. Infrastructure includes existing interior and exterior pasture and allotment boundary fences, existing stocktanks, and the potential to remove natural barriers to livestock movement. Allotment maps displaying existing range improvements, such as fences and water developments, were compared to maps displaying the proposed treatment units. Potential effects to the existing allotment infrastructure were based on the proximity of the existing improvements to the proposed treatment units. Since several of the allotments utilize short drift fences and natural barriers to control livestock movement, potential areas where natural barriers may be removed were also identified.

Spatial and Temporal Context for Effects Analysis

This analysis will discuss both short-term (one year or less), and long-term (greater than one year) project effects to livestock grazing activities, within the project area.

Present and Reasonably Foreseeable Actions Relevant to Cumulative Effects Analysis

Invasive plant control is an ongoing action in the project area that can affect livestock grazing. Spraying to control invasive plant species is expected to continue, and additional biological agents will be introduced.

See table 24 at the beginning of chapter 3 for a full list of present and reasonably foreseeable actions for the project area.

Alternative 1 – No Action

Direct, Indirect Effects and Cumulative Effects

For alternative 1, there would be no direct, indirect or cumulative effects to existing grazing activities or allotment infrastructure for the Flint Foothills Project because no project activities are proposed.

The continued treatment of noxious weeds would improve range conditions throughout the allotments within the project area through continued reduction in infested acres (see the Invasive Plant Species section).

Alternative 2 – Proposed Action

Direct and Indirect Effects

There would be no increase in livestock numbers or increase in season of use resulting from implementation of alternative 2. The effects of proposed vegetation management activities on livestock grazing activities within the analysis area would be mostly beneficial. Specifically, the salvage logging and thinning operations would indirectly increase short-term forage production through removal of conifers, and “daylighting” of forested stands so that sunlight is able to reach the forest floor to stimulate herbaceous plant growth. This short term flush of herbaceous growth would diminish as conifers recolonize the harvest units.

This alternative has the potential to directly affect existing allotment infrastructure. Infrastructure includes existing interior and exterior pasture and allotment boundary fences, existing stocktanks, and the potential to remove natural barriers to livestock movement. Damage to existing fences, water developments, or breaching natural barriers, could affect livestock distribution and movement. This could disrupt scheduled grazing rotations within allotments, and allow cattle in unauthorized areas.

In regards to grazing management, all range allotments within the analysis area are being managed under rest-rotation or deferred-grazing systems, and these systems are flexible enough that they can be adjusted to accommodate proposed vegetation management activities.

Removing timber during harvest activities along existing natural barriers, which are often used as pasture barriers or barriers between allotments, would open the area for livestock to freely breach the barrier, resulting in unauthorized drift into adjacent pastures or allotments. Timber Unit Standard 4 within the Forest Plan (USDA Forest Service 2009) requires “replacement of natural barriers to livestock movement removed by harvest activities with some other barrier.” Existing fences and water developments would be protected during project implementation.

Cumulative Effects

The cumulative effects of improved range conditions through short-term forage production and continued treatment of invasive plant species would be beneficial to forage species.

Summary of Effects

Implementation of the proposed alternative would have short-term benefits to livestock grazing assuming all allotment infrastructures are protected and any natural barriers removed are replaced with new barriers in a timely manner. Forage production should increase through the removal of conifers, which would stimulate herbaceous plant growth. This short-term flush of

herbaceous growth would diminish as conifers recolonize the harvest units. There should be no disruption to cattle grazing from the Flint Foothills Project. All allotment infrastructures would be protected, and barriers removed would be replaced in a timely manner.

Alternative 3

Direct, Indirect Effects and Cumulative Effects

The direct, indirect effects are the same for alternative 3 as described in the alternative 2 discussion.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Beaverhead-Deerlodge Land and Resource Management Plan (LRMP)

For all alternatives, livestock grazing activities would continue to be managed in compliance with grazing direction identified in the Forest Plan as well as the allotment management plans.

Recreation

Introduction

This section analyzes the effects the proposed activities would have on the recreation resources within the project area.

Overview of Issues Addressed

No issues were identified that relate to recreation. One outfitter guide provided a scoping comment that stated the proposal may impact some of their hunting in the Gird Creek drainage, but noted that adjustments could be made due to the large size of the area.

Measurement Indicators

The measurement indicators used to evaluate impacts of alternatives:

- Effects to developed and dispersed recreation activities, sites, and facilities
- Analyzes how the proposed actions affect the use, availability, and quality of the recreation experience within the project area.
- Consistency with Recreation Opportunity Spectrum - Analyzes the consistency of the proposed action with established recreation opportunity spectrum (ROS) objectives for the project area (Forest Plan allocations: summer road-based, and winter motorized, pp. 54-55; and 112).

Affected Environment

The Flint Foothills MA portion of the project area (85 percent) provides a roaded setting for dispersed recreation. The Flint Uplands MA (15 percent) provides a mix of semi-primitive motorized and nonmotorized recreation settings (table 93). There are no specially designated areas within the project area boundary (i.e., wilderness, wilderness study, or recommended wilderness areas). A small portion of the Dolus Lake Inventoried Roadless Area (I-439) is

within the project area's south boundary, while a larger portion is adjacent to the project area, and can be viewed from within the project area (see figure 43B).

Existing Condition

The Flint Foothills form a scenic backdrop for Interstate 90 between Drummond and Butte. A portion of Montana Highway 1, outside of the project area, is designated the "Pintler Scenic Loop" (Helena 2011). Evidence of timber harvest and vegetation management activities are common sights within the Flint Foothills MA portion of the project area. The history of use and management is reflected in the developed road systems, mining sites, and scenery (USDA Forest Service 2009). Evidence of beetle-killed trees is a typical sight (USDA Forest Service 2009).

The area within the Flint Uplands MA in the higher elevations provides a mix of semi-primitive motorized and nonmotorized recreation opportunities. The setting appears as a mix of managed and naturally appearing landscape. High mountain scenic vistas and backcountry opportunities are key attractions to the forest visitor traveling through this area. Roads within the management area are primarily historic roads built for harvesting and vegetation management, mining, and dam maintenance (USDA Forest Service 2009).

Figure 43 A and B depicts two popular attractions in the project area—the Douglas Cabin and the Dolus Lakes Inventoried Roadless Area (IRA). A small portion of the IRA is within project area; the majority is adjacent to the project area and part of the scenic vista.

Figure 43A. Douglas Cabin is within the project area boundary. 43B. North aspect of Dolus Lakes Inventoried Roadless Areas (I-439) adjacent to the project area and part of the scenic vista

Recreation Activities

Recreation activities are mostly dispersed and commonly occur on or along roads. Gathering firewood, weekend camping, fishing and hunting are popular pursuits for local and regional visitors (USDA 2009). Visitors can expect to encounter other users with motor vehicles, those travelling by foot, stock, and mountain bikes in the summer, or skis and snowmobiles during winter months.

Two outfitter and guide special use permit holders who operate within the project area:

> Royal Outfitters – Their area of operation extends into the southwest end of the project area with Gold Creek Lake and NFS Road1550 as the general limit of extent. Area of operation occurs in both Flint Foothills and Flint Uplands management areas. This outfitter and guide's focus is summer use and fall big game hunting.

Bartlett Creek Outfitter – Their area of operation extends approximately one mile into the southeastern corner of the project area. Area of operation occurs in both Flint Foothills and Flint Uplands management areas. This outfitter and guide's focus is fall big game hunting.

Recreation Sites

The Douglas Cabin is the only developed recreation site in the project area. It is a recreation rental facility and a favorite of hunters during rifle and bow seasons and is popular among snowmobilers during winter months. The Recreation Opportunity Spectrum (ROS) map (figure 44) in the Desired Condition section that follows displays the location of the cabin.

Recreation Roads and Trails

There are approximately 204 miles of roads and 7.5 miles of trails available for public access and use within the project area boundary. Approximately 30 miles of these roads are considered unauthorized. The access from the road system for recreational purposes is currently affected by storm repair damage, which is resulting in road closures and detours. These roads include sections of National Forest System (NFS) roads 707, and 8402 (see the Transportation section).

Trails are in the southern portion of the project area and include National Forest System trails 8054 (3.9 miles, motorized), 8049 (1.37 miles, nonmotorized) and 8052 (3.39 miles, nonmotorized). The trails are displayed on the alternative maps, Figure 4 and figure 6, in chapter 2. Motorized users of NFS Trail 8054 currently experience periods of limited availability. National Forest System Road 1550, which accesses the north end of trail 8054, is closed to motorized use from October 15 – December 1. National Forest System Road 1500, which accesses the south end of trail 8054, is closed to motorized use from September 1 – June 15.

Recreation Streams and Lakes

Streams and lakes are features that people use for various forms of recreation including fishing and boating. There are approximately 55 miles of streams within the project area, but none are rated as class one (i.e., considered larger or major rivers). There are four lakes (used for recreation activities) within the project area: Goldberg Reservoir, Big Gold Creek Lake, Little Gold Creek Lake, and Rainbow Lake. Goldberg Reservoir is the only popular recreational lake within the project area that is connected to a National Forest System road associated with the proposed action. None are listed among the lake and pond fishing areas on the Beaverhead-Deerlodge National Forest's webpage. Gold Creek Lake(s) and Goldberg Reservoir are on the Trout Nation website (Montana 2011). See the ROS map (figure 44) presented in the Desired Condition section that follows for location and distribution. No designated wild and scenic rivers or other water bodies of national importance are located in the project area.

Desired Condition

The Forest Plan lists elements of the desired condition on page 11. The one that relates most closely to recreation and scenery states, "Visitors benefit from a range of primitive to developed recreation settings and opportunities. Most of the BDNF continues to offer uncrowded motorized and nonmotorized backcountry opportunities (USDA Forest Service 2009)." The Forest uses the agencies Recreation Opportunity Spectrum concepts and definitions to establish allocations for recreation use. Table 93 lists the adopted summer-based allocations within the project area that are applicable to this proposal, followed by a map that displays the distribution.

Table 93. Forest Plan Recreation Allocation – Summer and Road-based ROS descriptions (USDA Forest Service 1986)

Forest Plan Allocation	Equivalent ROS Class	Description
Summer Motorized Backcountry	Semi-primitive Motorized	Offers opportunities for varied types of travel and recreation activities
Road Based*	Roaded Natural Rural	Offers opportunities for varied types of travel and recreation activities
Summer Nonmotorized	Roaded Natural Rural	Offers opportunities for mountain biking, horse and stock travel, hiking and dispersed camping etc.

*All proposed activities occur in this allocation

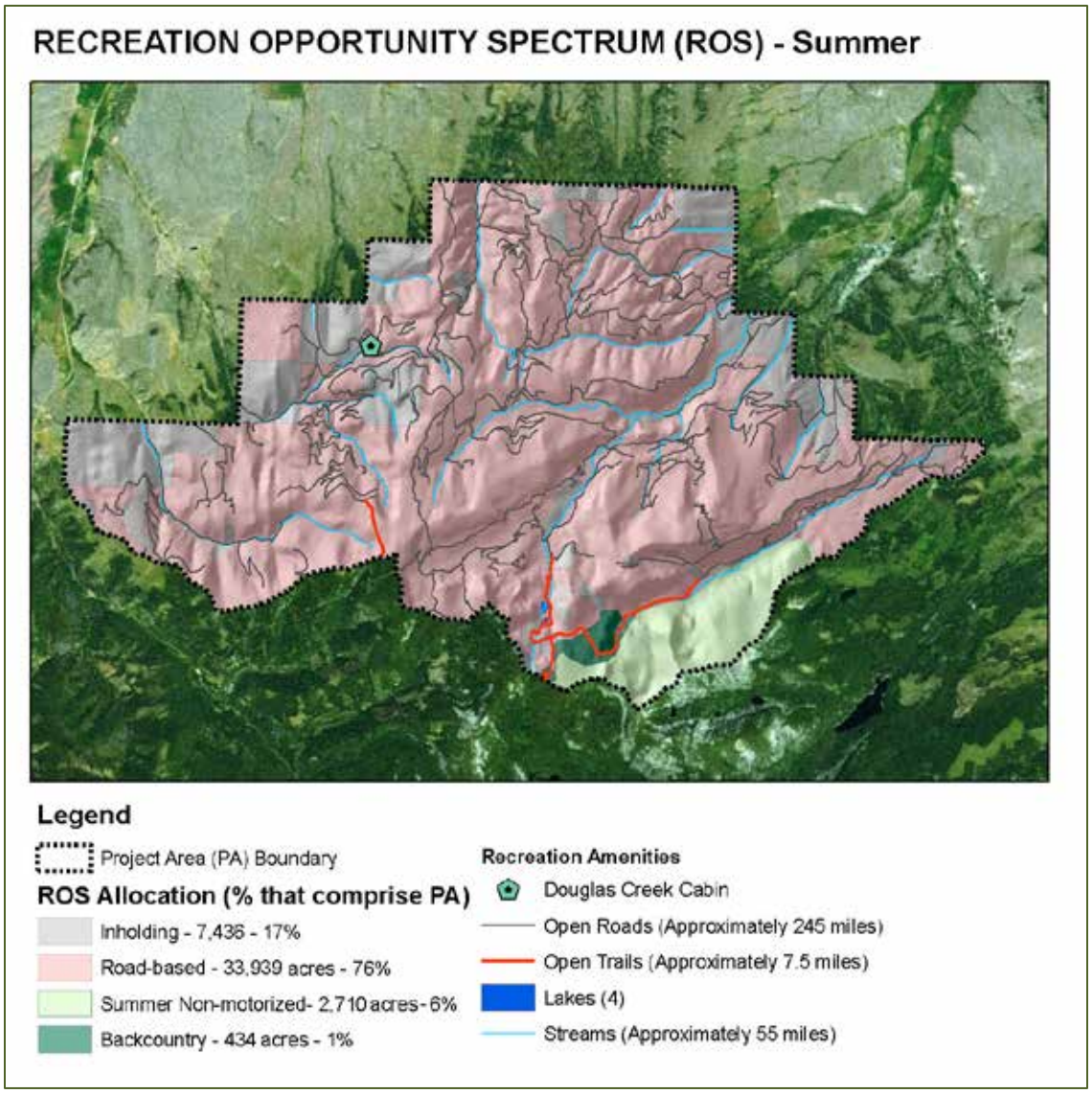


Figure 44. Summer ROS allocations and location of recreation features

Winter allocations are also assigned to this area in the Forest Plan, but there are no activities proposed for implementation in the winter, so they are not included in this discussion. The Recreation report in the project file displays the winter ROS map and descriptions.

Environmental Consequences

Methodology

The proposed vegetation and road treatments are dispersed throughout the project area. Potential effects to forest visitor's recreation experience are based on the indicators identified in the Overview section.

Spatial and Temporal Context for Cumulative Effects Analysis

Spatial Boundary: Project Area

Rationale - Consistency with ROS settings outside the project area boundary do not apply.

Temporal boundary: Short-term timeframe: 1-5 years (period of project implementation)

Rationale - The timber sale contract may last up to 5 years, and disruptions would be intermittent over that timeframe during the normal operating period. This assumes that the prescribed burning would also occur during this timeframe.

Long-term timeframe: 5 years and beyond (i.e., after project completion)

Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

Activities that have occurred or may occur in the assessment area that have an effect on recreation resources are: livestock grazing, mining, noxious weed control, use and maintenance of forest roads and trails, firewood cutting, timber harvest, wildfire and fire management and suppression activities. Fire management and suppression has occurred throughout the project area. Hazard tree removal has occurred and continues to occur along roads and near developed recreation sites (i.e., the area around the Douglas cabin). Motor vehicle use mapping (MVUM) as part of the travel planning process is a reasonably foreseeable future activity that may affect the recreation resource. Effects from this action could change the overall mileage of trails open or closed to motorized vehicles within the project area and across the forest.

See table 24 at the beginning of chapter 3 for a full list of present and reasonably foreseeable activities that affect the Flint Foothills Project area.

Alternative 1

Under alternative 1, there would be no direct, indirect, or cumulative effects on recreation resources because no project activities are proposed.

Use and opportunities available regarding the recreation amenities identified in the Existing Conditions section would remain, and are consistent with the ROS classification within the project area boundary.

Cumulative Effects

Since there are no activities proposed, this alternative would not contribute to past, present or reasonably foreseeable effects on developed and dispersed recreation activities, sites and facilities, or cause any inconsistencies with the ROS settings.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Dispersed Activities

No permanent direct or indirect adverse effects to dispersed recreation opportunities from vegetation treatments proposed in alternative 2 are anticipated. All of the newly constructed temporary roads would be obliterated; the majority of the unauthorized routes would be decommissioned; and the newly constructed NFS road would be put into “storage” following project implementation.

Currently open segments of UR8-246 (0.4 mile), UR8-271 (0.5miles), and UT8-110 (0.2 mile) would be decommissioned. The effect of this action is a 1.1 mile reduction in opportunity for various dispersed road-based activities (i.e. roadside camping, parking for hunting, etc.). Currently closed UR-253 (0.4 mile) would be added to the Forest’s transportation system, and available for the type of road based activities and uses described above. These actions would result in a net reduction of 0.6 mile of open road.

Forest visitors (e.g., hunters, outfitter guide /special use permit holders, and others who participate in dispersed recreation activities) would likely experience occasional, intermittent delays and reduced access to forest areas while operations (logging and prescribed burn treatments) are under way. A timber sale contract typically has a 5-year term. The prescribed burning activities in units 2b, 3b, 4b, 5b, 6b, 7b, and 8b would likely take place over several years, and could occur in either the spring or fall. Forest visitors (described above) in the vicinity of implementation activities may experience indirect effects from sounds and sights such as timber falling, log hauling, noise, and dust. A project design feature is in place to mitigate roadway interference and provide for greater safety during weekends and federal holidays (Recreation project design features and mitigation measures, chapter 2).

In the short term, stumps, slash and logging activities may affect recreation experiences: Tree stumps and harvest slash would be apparent to users traveling through treatment areas until vegetation becomes established or until slash is eliminated. In the long term, as openings created by logging are replaced with healthier stands that offer more diversity in terms of scenery, canopy and ground cover, those seeking camping and other dispersed forms of recreation would benefit.

Recreation Sites

The only developed recreation site managed by the Forest Service within the project area boundary is Douglas Cabin. Commercial thinning and seed tree units are proposed approximately 800 feet behind it. The access road to the cabin is NFS Road 707, which is also a haul route, and has the potential to create dusty conditions that could disturb users of the cabin. NFS Road 707 services 14 units and would require an estimated 453 haul truck trips to complete the treatment activity. Project design features would help to control dust during cabin

use periods, mitigate roadway interference and provide for greater safety during weekends and federal holidays (Recreation project design features and mitigation measures, chapter 2).

Recreation Use of Roads and Trails

Prescribed burn unit 4b is proposed where Forest System Trail U8049 meets the project area boundary and unit 29P (a precommercial thinning prescription) is located at the trails terminus. In the shorter term, opportunity to access portions of this trail is expected to be reduced during periods of prescribed burning implementation. Forest System trails 8054 and 8052 would not be affected.

A 450-foot section of NFS Trail 8049 is bisected by burn unit 4b. During periods of implementation, opportunity to access portions of this trail would be limited as short-term closures could be expected. Users of NFS Trail 8049 could be exposed to smoke while this unit is treated as well. The public accessing and using Trails 8054 and 8052 would not notice any effects. No permanent addition or reduction of trails miles would result from the proposed action.

Approximately 70 miles (30 percent) of NFS roads within the project area boundary would be used as haul roads. National Forest System roads 1544 and 1557 access many salvage treatment units and are expected to be the most heavily used. Staging equipment and loading haul vehicles would likely occur directly from the roadside of units adjacent to these roads. There is the potential for temporary closures that could affect recreation access and availability (including hunting) but types of closures would vary. The following photos were taken in the project area and exhibit temporary closures that could be anticipated.

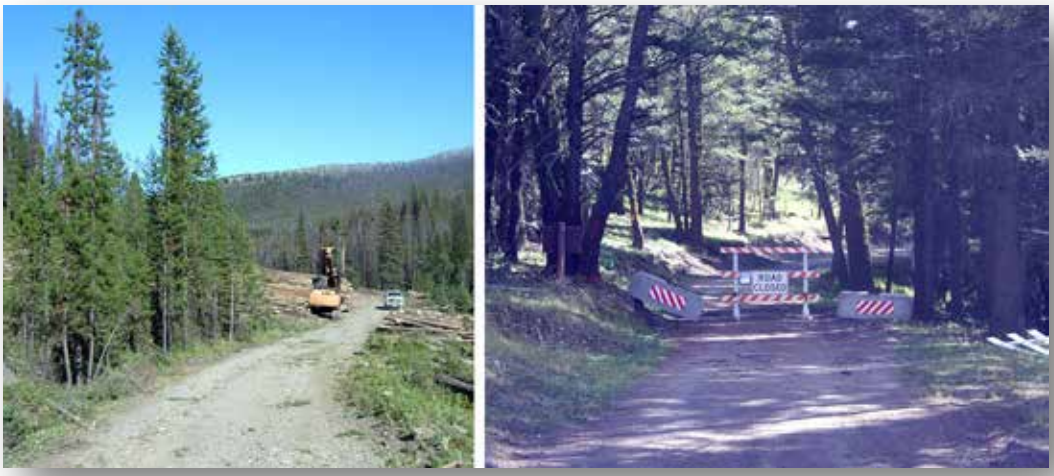


Figure 45. Images reflecting typical but short-term closures that may limit or restrict access within the project area during periods of project activity

A project design feature is in place to mitigate roadway interference and provide for greater safety during weekends and federal holidays.

Recreation Use of Streams and Lakes

Goldberg Reservoir is the only popular recreational lake in the project area that is connected to a NFS road associated with the proposed action. Delays or limits to access for this reservoir

would be expected during implementations. Access or limits to use because of proposed management activities are not expected for stream sections within the Flint Uplands Management Area of the project area.

Sections of Dunkelberg Creek may be affected since the stream is in proximity to unit 61S and follows NFS Road 1544 (a haul route) for approximately 1.5 miles. Effects would be short term, intermittent delays to accessing the creek at various places while proposed maintenance activities (to bring road to standard) and eventual hauling occurs. Similar effects can be anticipated (under the same rationale) for sections of Douglas Creek that follow NFS roads 1544 for approximately 2.5 miles and 707 (also a haul route) for approximately 1 mile.

Consistency with ROS

Approximately 1.3 miles of new road constructed under this alternative would be put into storage when the project is completed and not available for future use. All activity is proposed in summer road based settings. The Douglas Cabin where units 30ST, 28CS, 33C and 31C are proposed is also allocated as a winter nonmotorized setting. However, no project activities are proposed during winter. All activities would remain consistent with the current ROS setting as a result of proposed actions.

Cumulative Effects

The types of projects that could impact recreation are current roadside salvage harvest, ongoing travel management and trail and road maintenance. Trail maintenance is a recreation-related project expected to occur in the future; however, no such projects are currently scheduled or planned. Trail maintenance would be neutral or beneficial to the user.

The current Roadside #4 Hazardous Tree Removal Project and salvage activities discussed in the proposed action would cumulatively reduce the abundance of hazardous snags and future downfalls from Forest System roads and the general area. The two projects would not overlap in time, so there would be no cumulative effects to recreation due to combined operations (access closures, traffic delays, etc.).

Short-term effects to the recreation experience are associated with operations during implementation, as tree stumps and harvest slash would be apparent to users traveling through treatment areas until vegetation becomes established or slash eliminated. Combined with the ongoing declining recreation setting because of dead and dying beetle-affected trees, the quality of the recreation experience would be reduced. In the long term, these projects benefit recreation use by moving the land toward the desired condition and meeting standards set for recreation in the Forest Plan.

Road maintenance projects (replacing culverts, etc.) benefit most recreation users by ensuring safe access to the forest continues. Removing hazardous trees, ongoing road maintenance, and maintenance and reconstruction associated with the haul routes under the proposed action could cumulatively provide better driving and forest experiences for the forest visitor.

Travel management can affect recreation users who rely on motorized vehicles as a form of recreation or as access to recreation areas. Future travel management decisions may reduce or increase the available miles but those decisions are forthcoming so there can be no certain determination of their cumulative effects in regards to recreation at this time.

Alternative 3

Direct and Indirect Effects

Dispersed Activities

Effects to activities would be similar as described under alternative 2.With alternative 3, UR8-246 (0.4 mile) would be decommissioned; and currently closed UR-253 (0.4 mile) would be added to the Forest's transportation system , and available for road based activities and uses. These actions would result in a negligible increase (about 200 feet) in miles of open road.

No new system or temporary roads would be constructed; fewer treatment units are proposed overall under alternative 3. Under this alternative, hunters, special use permit holders, and others who participate in dispersed recreation activities would encounter fewer short-term delays to access the general forested area than under alternative 2. Other recreation activities within the affected environment would be expected to have the same effects as described under alternative 2.

Recreation Sites

Effects to recreation sites as described under alternative 2 are the same for alternative 3. Both alternatives offer the same actions within the vicinity of Douglas Cabin and the same project design features apply, so effects would be expected to be the same.

Recreation Use of Road and Trails

Effects to road and trail use would be similar as discussed previously under alternative 2 with respect to temporary closure and delays. Haul roads identified under alternative 3 are the same as under alternative 2. However, alternative 3 anticipates approximately 118 fewer loads hauled along NFS Road 8402. Any perceived difference to the public in terms of closures or delays as a result is anticipated to be minimal.

Recreation Use of Streams and Lakes

The activities proposed under alternative 3 are the same as alternative 2 with respect to affected steams or lakes within the project area boundary, and the effects are described under alternative 2 previously.

Effects to ROS

The activities proposed under alternative 3 are the same as for alternative 2 with respect to effects on ROS classification within the project area boundary.

Cumulative Effects

In terms of the recreation resource, proposed activities for alternatives 2 and 3 are similar enough that the cumulative effects discussed previously in alternative 2 apply to both alternatives.

Summary of Effects for Alternatives 2 and 3

The majority of effects to recreation resources are short term. Temporary delays and closures create limited access while treatments occur within the project area boundary. Limited access would affect various recreation activities, sites, roads, and trails. Upon completion of treatment activities, access and opportunities would primarily revert as they currently exist – no new or

different activities, trails, facilities, or other opportunities would result from any of the proposed actions. There would be a net reduction of 0.61 miles of open road in alternative 2; and a negligible increase (200 feet) in alternative 3. There are no irreversible or irretrievable commitments related to recreation resources from the proposed action.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

All alternatives would be consistent with the Forest Plan. Alternatives 2 and 3 would address recreation goals and objectives outlined in the 2009 Beaverhead-Deerlodge National Forest Revised Land and Resource Management Plan

Roadless Areas

Introduction

This section describes the roadless and unroaded resources in the planning area and analyzes the impact of the project's alternatives on those resources. The Dolus Lakes IRA (I-429) is a 9,365-acre IRA (inventoried roadless area) that overlaps the Flint Foothills project area; 3,158 acres of the Dolus Lakes IRA are in the project area. Unroaded resources are National Forest System (NFS) lands that are outside a designated Wilderness or IRA, but may yet retain some wilderness attributes or roadless characteristics. Collectively, IRAs and unroaded areas can be referred to and analyzed together as a roadless expanse, which would describe a contiguous land area comprised of unroaded areas adjacent to an inventoried roadless area.

The section discloses potential effects to wilderness attributes in the project area roadless expanse to determine if, or to what extent, future consideration for wilderness recommendations would be affected. This analysis focuses on the potential effects of the proposed action on wilderness characteristics as defined in the Forest Service Handbook (FSH) 1909.12 (72.1).

Forest Plan and Regulatory Framework

The Beaverhead-Deerlodge Forest Plan established forestwide multiple use goals, objectives, and management area direction. The analysis of inventoried roadless areas (IRA) is documented in appendix C of the FEIS for the Plan—inventoried and evaluated areas with wilderness potential— using a methodology consistent with Forest Service policy direction. Appendix C of the FEIS for the BDNF Forest Plan (2009) provides additional detail on the methodology used for this evaluation. As a result of this Forestwide analysis, some roadless areas were recommended for inclusion in the National Wilderness Preservation System and others were not. The Dolus Lakes IRA (1-429), which overlaps the project area, was not recommended for inclusion in the National Wilderness Preservation System. The vast majority of the IRA was assigned to the Flint Uplands management area (MA), which is managed for a mix of semi-primitive motorized and nonmotorized recreation, as well as secure high-elevation wildlife habitat. Approximately 80 acres were assigned to the Flint Foothills MA and managed for timber production, livestock grazing and dispersed recreation.

No Forestwide or management area standards specific to inventoried roadless areas or areas evaluated for wilderness potential that were not recommended for designation as wilderness were prescribed in the 2009 Forest Plan. The Forest Plan does, however, prescribe more general management direction which overlaps with Inventory Roadless Areas (IRAs) and other areas considered for wilderness potential in this analysis. This management direction takes the form

of place-based management area goals, objectives, or standards; recreation allocations and specific standards for resources across the Forest. Forest Plan standards exist to ensure that specific management direction is followed.

Methodology

The principal attributes of wilderness listed below, as described in Forest Service Handbook (FSH) 1909.12, are generally, but not necessarily listed in order of importance or desirability (USDA 2007). The FS Handbook directs managers to consider these five characteristics when analyzing the quality of the wilderness resource of potential wilderness areas.

Measurement Indicators

The measurement indicators used to evaluate impacts of alternatives:

- **Natural:** Ecological systems are substantially free from the effects of modern civilization and generally appear affected primarily by forces of nature. Effects of modern civilization include:
    a. The presence of nonnative species that alter the composition of natural plant and animal communities (such as nonnative plants, animals, fish, livestock, invertebrates, and pathogens).
    b. Developments that degrade the free-flowing condition of rivers and streams (such as dams or other water diversions and impoundments).
    c. The presence of light pollution that degrades night sky quality and night sky quality related values.
    d. The presence of pollutants that degrade water quality.
    e. The health of ecosystems, plant communities, and plant species that are rare or at risk.
- **Undeveloped:** The degree to which the area is without permanent improvements or human habitation. A measure of undeveloped is the level of human occupation and modification including evidence of structures, construction, habitations, or other forms of human presence, use and occupation.
- **Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation:** The area provides solitude or primitive and unconfined types of recreation including a wide range of experiential opportunities such as: physical and mental challenge, adventure and self-reliance, feelings of solitude, isolation, self-awareness and inspiration. Solitude is the opportunity to experience isolation from sights, sounds, and the presence of others from the developments and evidence of humans. The opportunity to experience isolation from the evidence of humans, to feel a part of nature, to have a vastness of scale, and a degree of challenge and risk while using outdoor skills are measures of primitive and unconfined recreation.
- **Special Features and Values:** The area provides other values such as those with ecologic, geologic, scientific, educational, scenic, historical, or cultural significance. Examples include unique fish and wildlife species, unique plants or plant communities, connectivity, potential or existing research natural areas, outstanding landscape features and significant cultural resource sites.
- **Manageability:** In determining capability, consider the ability to manage an area as wilderness as required by the Wilderness Act. Section 2(c) of the Wilderness Act defines wilderness as an area that, "…(3) has at least 5,000 acres of land or is of sufficient size to

make practicable its preservation and use in an unimpaired condition." The Forest Service's ability to manage an area as an enduring resource of wilderness, untrammeled by humans, retaining its primeval character, and to protect and manage its natural character are all factors to consider. Consider such factors as size, shape, and juxtaposition to external influences. Evaluate how boundaries affect manageability of an area. In the most desirable situations:

a. Boundary locations avoid conflict with existing or potential public uses outside the boundary that might result in demands to allow nonconforming structures and activities in the wilderness.
b. It is possible to readily and accurately describe, establish, and recognize boundaries on the ground.
c. Boundaries, where possible, conform with terrain or other features that constitute a barrier to prohibited use.
d. Boundaries provide adequate opportunity for access and traveler transfer facilities.

Table 94 shows how these wilderness attributes from FSH 1909.12 correspond to the characteristics of roadless areas listed in the 2001 Roadless Rule.

Table 94. Crosswalk between wilderness attributes and roadless area characteristics

Wilderness Attributes	Roadless Area Characteristics
Natural (ecological systems are substantially free from the effects of modern civilization and generally appear to have been affected primarily by forces of nature)	High quality or undisturbed soil, water, and air; Sources of public drinking water: Diversity of plant and animal communities; Habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land; Reference landscapes
Undeveloped (degree to which the area is without permanent improvements or human habitation)	Natural appearing landscapes with high scenic quality
Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation Solitude: opportunity to experience isolation from the sights, sounds, and presence of others from the developments and evidence of humans Primitive and unconfined recreation: opportunity to experience isolation from the evidence of humans, to feel a part of nature, to have a vastness of scale, and a degree of challenge and risk while using outdoor skills.	Primitive, semi-primitive nonmotorized and semi-primitive motorized classes of dispersed recreation
Special Features and Values (capability of the area to provide other values such as those with geologic, scientific, educational, scenic, historic, or cultural significance)	Traditional cultural properties and sacred sites; and Other locally identified unique characteristics.
Manageability (the ability of the Forest Service to manage an area to meet size criteria and the elements of wilderness)	No criteria

The analysis that follows focuses on wilderness attributes and examines whether the actions proposed would potentially affect the future wilderness value of the roadless expanse in the project area. In addition, projects on lands contiguous to, or within Inventoried Roadless Areas must also analyze the environmental consequences of the proposed actions, including the irreversible and irretrievable commitment of potential wilderness attributes.

Affected Environment – Existing Condition

The Dolus Lakes Inventoried Roadless Area (IRA) (I-429) is a 9,365-acre IRA that overlaps the southeastern section of the project area; 3,158 acres of Dolus Lakes IRA are in the project area. Unroaded resources are National Forest System (NFS) lands that are outside a designated Wilderness or IRA, but may yet retain some wilderness attributes or roadless characteristics.

Collectively, IRAs and unroaded areas can be referred to and analyzed together as a "roadless expanse," which describes a contiguous land area comprised of unroaded areas adjacent to an inventoried roadless area. The analysis of the roadless expanse for the Flint Foothills Project describes the roadless and unroaded resources in the planning area, and analyzes the impact of the project's alternatives on those resources.

The roadless expanse is defined as the entire Dolus Lakes IRA including the portion of the IRA that extends south of the project area. It also includes all unroaded polygons that are adjacent to the Dolus Lakes IRA and not separated by a road. The unroaded polygons adjacent to Dolus Lakes IRA were identified through a GIS analysis. The Flint Range IRA, which is located outside the project area to the south, is also considered an adjacent unroaded polygon and is included in the roadless expanse. The size of the roadless expanse is 163,327 acres. This roadless expanse boundary is appropriate because it includes the entirety of the IRA overlapping the project area boundary, adjacent to areas where treatment units are proposed, and includes all unroaded lands contiguous to the IRA.

Figure 46 provides a depiction of roadless expanse boundaries, existing roads and trails, proposed treatment units[31] and temporary roads within the roadless expanse. No treatments are proposed within the IRAs.

The Dolus Lakes IRA and its contiguous unroaded areas are located in the Flint Uplands and Flint Foothills management areas. There are no roads or trails in the part of the Dolus Lakes IRA that is in the project area. There are two National Forest System Trails (8052 and 8054) in the unroaded section of the roadless expanse within the project area, to the northwest of the IRA boundary. National Forest System Trail 8052, running along the northern boundary of the IRA, is nonmotorized. National Forest System Trail 8054 is a motorized trail running north/south in the western half of the roadless expanse. The recreation allocations in the roadless expanse are summer and winter nonmotorized recreation for most of the IRA itself, with motorized recreation permitted in the rest of the unroaded expanse (figure 46). There are approximately 25 miles of National Forest System road in the Dolus roadless expanse. Most of these roads stretch into the roadless expanse from its edges and dead-end in the roadless expanse. Figure 55 in the Scenic Resources section shows a view of the Dolus Lake IRA.

None of the Dolus roadless expanse has been identified as potential wilderness or recommended for federal wilderness designation.

[31] Treatment units shown on figure 42 are units from the proposed action.

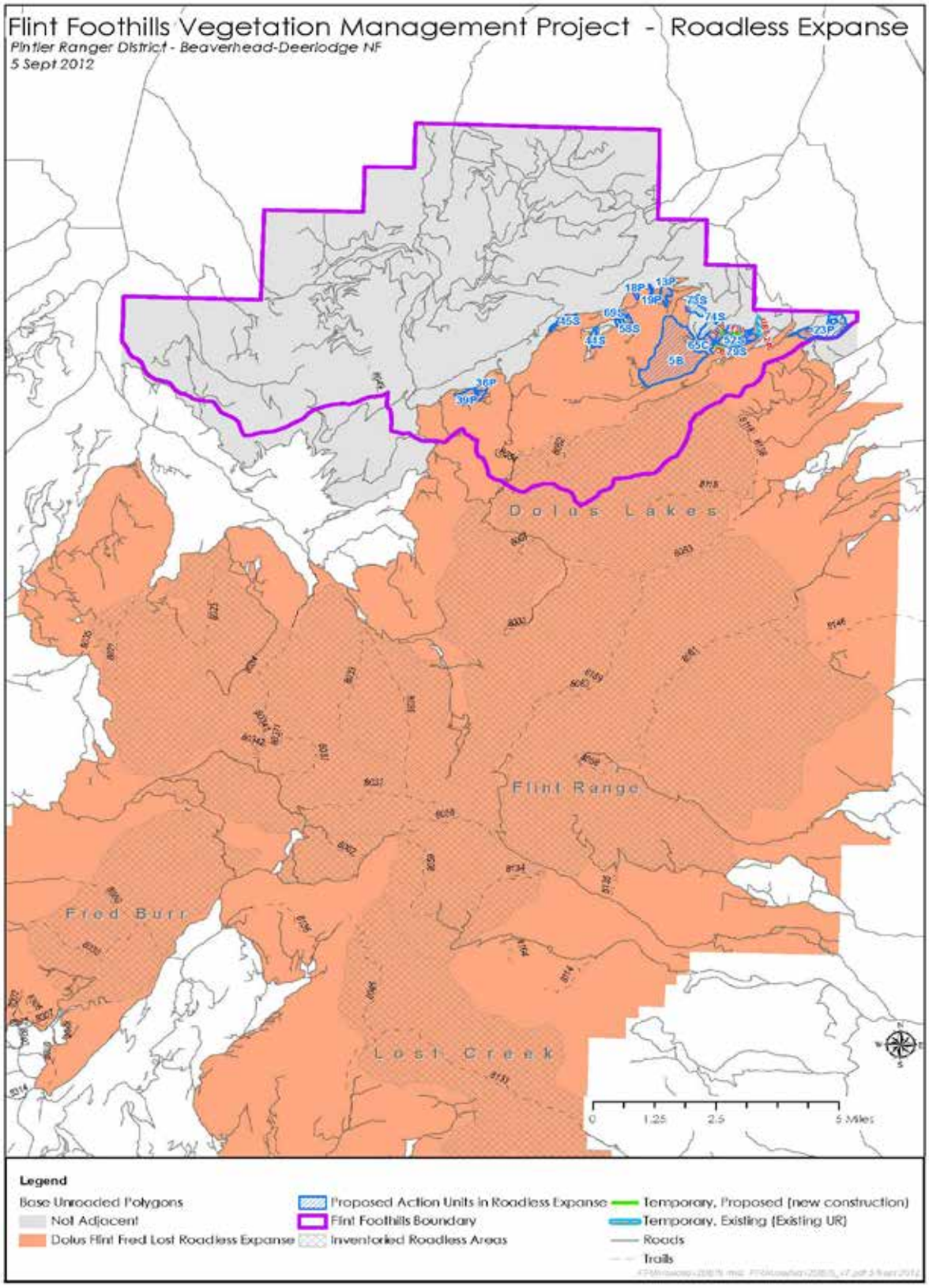


Figure 46. Flint Foothills Project roadless expanse

Existing Wilderness Attributes

In 2003, the BDNF undertook an assessment process whereby the wilderness potential of each IRA was quantitatively assessed. These worksheets, the Inventoried Roadless Area Capability Assessment (USDA Forest Service 2003) graded each IRA according to five main elements to help determine the wilderness potential of inventoried roadless areas. A summary of these worksheet scores is reflected in appendix C of the BDNF Forest Plan FEIS (USDA Forest Service 2009), and the actual worksheets are in the Forest Plan record. The ratings scale used to grade the IRA performance in these elements is: High = 10, Moderate =5, Low = 1. The Dolus Lakes IRA[32] received the following scores:

- Environment (i.e. natural integrity and apparent naturalness) – Moderate (7.5)
- Recreation Opportunities (solitude, challenge and adventure, diversity) – High (9)
- Special Features (scientific, educational, historic, scenic, variety and abundance of wildlife) Moderate (5.8)
- Manageability – Moderate (4.3)

The capability worksheets also ask six yes or no questions that pertain to the area's availability for wilderness consideration. The answers to these questions suggest that, overall; this area has moderate availability for wilderness consideration. The six yes or no questions are: (1) Is the area vitally needed for increased water protection or storage? (2) Would wilderness management seriously restrict important wildlife management? (3) Does the area have high strategic mineral development or potential? (4) Are there unique or outstanding natural phenomenon that requires public access and development be inconsistent with wilderness designation? (5) Is the land needed to clearly document resource demands such as timber, minerals, or recreation sites including winter sports? (6) Are there existing contractual or other significant obligations on the area not in concert with wilderness designation?

To further describe the analysis area's existing condition, the roadless expanse was evaluated from the perspective of the five wilderness attributes described in the analysis methods section and summarized in table 94. These descriptions can be found in the Individual Roadless Area Evaluations section in appendix C of the BDNF Forest Plan FEIS (USDA Forest Service 2009).

Natural and Undeveloped Attributes

The Dolus Lakes and Flint Range IRAs, within the roadless expanse, are described in the corrected FEIS for the Forest Plan,(USDA Forest Service 2009 pp. C 58-59), as mostly natural appearing, with moderately high scenic integrity. Exceptions to this include scattered historic mining, drill sites, exploration pits, low standard roads, and trails. There are also many roads within and around the edges of the roadless expanse, which impact the naturalness of the area. Past management activities are also evident. The natural integrity has also been slightly reduced by livestock grazing and fluctuating water levels. Grazing allotments in the analysis area support a very limited number of cattle. Streams maintain their biological values, channel structure, and riparian function, and are used for downstream irrigation.

The IRA portion of the roadless expanse also provides secure habitat for wildlife, enhancing linkages and connectivity across the landscape in between the Greater Yellowstone Area (GYA) and forests to the west and north. There is mapped Canada lynx habitat and wolverine denning habitat. In addition, westslope cutthroat and bull trout inhabit some stream segments.

[32] The Capability assessment for the Dolus Lakes IRA also includes the Flint Range IRA.

Some of the Dolus roadless expanse is favorable for mining deposits, including gold-silver veins and associated base metals. The area is considered a high value known locatable mineral deposit area. Oil and gas potential for the area is low.

The unroaded polygons in the northern portions of the roadless expanse, further away from the IRA, are already influenced by human development and are less natural appearing. There is evidence of past harvest activity in the northern end of the roadless expanse, as well as a much more roaded landscape. Vegetation treatments have occurred from 1960 to the present on approximately 2,700 acres. Forty-nine miles of road, at a density of approximately 1.2 miles of road per square mile, currently exist in this section of the roadless expanse.

Solitude and Primitive Recreation Attributes

The Dolus IRA provides many opportunities for solitude, primitive recreation, and challenging hiking or climbing. Numerous small lakes are surrounded by cool moist forests, and enhance opportunities for solitude. Some of the lakes are popular for family outings, however; this influx of people would reduce the opportunity for solitude. Fall hunting season also brings visitors to the backcountry of the roadless expanse. Snowmobiling is popular on motorized trails of the expanse in winter, reducing the solitude and primitive recreation potential of those areas.

There are not opportunities for solitude or primitive recreation in the entire roadless expanse however; because the northern half of the roadless expanse—away from the Dolus IRA—is a more roaded landscape with a motorized recreation setting. Primitive recreation opportunities and solitude would be more difficult to find in this portion of the roadless expanse.

Special Features

A limited amount of survey work has been done within the IRA portion of the roadless expanse, producing some heritage sites. More would likely be found with additional survey work. There are no other known special features in the Dolus roadless expanse.

Manageability Attributes

The boundaries of the Dolus IRA generally follow topographic features, and are therefore favorable towards manageability as a wilderness. In the larger roadless expanse however, there are several different blocks of private inholdings, which would make manageability more difficult.

Environmental Consequences

Spatial and Temporal Boundaries

The spatial boundary for the Flint Foothills roadless analysis is the “roadless expanse” as described in the previous section.

The temporal boundaries of the effects analysis s are determined by how long the effects of project activities will last. Direct and indirect effects to unroaded areas can be either short term or long term. Short term or temporary effects are the human-induced impacts to the land surface and vegetation that the land would recover from within ten years after initiation of the activity. Long-term effects are human-caused disturbances that would be evident on the landscape for more than 10 years.

Alternative 1 – No Action

Direct and Indirect Effects

For alternative 1, there would be no direct, indirect or cumulative effects to the roadless expanse because no project activities are proposed. Therefore, there would be no effect on the existing naturalness of the area from the project.

The roadless expanse spans a wide range of degree of naturalness, from the more natural, undisturbed landscape of the IRA in the south, to the more actively-managed landscape in the north. This range of naturalness would not change in the no- action alternative. As no activities would occur in the roadless expanse, the ability to find solitude would remain as it currently exists. There is more ability to find solitude in the less-roaded southern roadless expanse landscape and less solitude potential in the more roaded north. This would not change with implementation of the no- action alternative.

Current manageability of the roadless expanse also would not change. A summary based on the current conditions assessment finds the IRA portion of the Dolus roadless expanse to have moderate wilderness suitability for inclusion into the Wilderness Preservation System. This would not change under the no- action alternative. Natural processes would continue to dominate in the IRA part of the roadless expanse, and the lands to the north of the IRA would continue to be more managed.

Alternative 2 –Proposed Action

Direct and Indirect Effects

The following table lists all alternative 2 vegetative treatments and acres proposed in the roadless expanse. These treatments are also depicted on figure 47, which focuses on alternative 2 treatment units and their distance from features in the roadless expanse

Table 95. Acres of vegetation treatments by unit in the Dolus roadless expanse for alternative 2

Vegetation Treatments in the Dolus Roadless Expanse for Alternative 2		
Treatment Type	**Unit**	**Acres**
Salvage by clearcut harvest	44S	31
	45S	31
	51S	19
	52S	94
	58S	49
	69S	2
	73S	64
	74S	74
	79S	31
Subtotal salvage by clearcut harvest		***395***
Commercial thinning treatment	65C	18
	66C	24
Subtotal commercial thinning		***42***
Precommercial thinning treatment	13P	50

Vegetation Treatments in the Dolus Roadless Expanse for Alternative 2		
Treatment Type	**Unit**	**Acres**
	18P	23
	19P	12
	23P	187
	36P	21
	39P	73
Subtotal precommercial thinning		***366***
Prescribed burning treatment	5B	710
Total Prescribed burning treatment		***710***
Total vegetative treatments in roadless expanse		***1,513***

Alternative 2 also proposes 0.59 mile of new temporary road construction, and would reconstruct 0.39 mile of existing unauthorized routes in the roadless expanse area to access the treatment units. All of the proposed temporary roads are on the eastern boundary of the roadless expanse analysis area. Table 96 lists these roads by type for the proposed action.

Table 96. Temporary roads and existing unauthorized roads in roadless expanse by type in alternative 2

New Temporary Roads and Existing Unauthorized Roads in the Dolus Roadless Expanse for Alternative 2	
Road type	**Miles**
New temporary road construction	0.59
Temporary road construction on existing unauthorized routes	0.39
Total temporary roads in the roadless expanse	**0.98**

The vegetation and road treatments listed above are proposed in the roadless expanse, outside the Dolus Lakes IRA boundary. The largest treatment proposed is in Unit 5B, a 710-acre prescribed burn unit. This unit proposes mixed-severity prescribed burning in lodgepole pine stands. It is located approximately 0.50 mile northeast of the Dolus Lakes IRA boundary, and proposes ignitions on approximately 40 percent of the unit. This would result in a mosaic of burned and unburned areas, with an objective of 50 percent mortality in unit overstory trees. The unburned portions of the unit would primarily include riparian areas. Control lines would primarily be natural features such as rock slopes and natural fuel breaks of different fuel types.

Units 51S, 52S, 65C, 66C, and 79S propose a total of 186 acres of a variety of salvage cutting and thinning actions in the northeast section of the roadless expanse, approximately 0.50 mile away from the Dolus IRA boundary. Units 73S and 74S straddle the eastern boundary of the roadless expanse, but are near enough to potentially impact the wilderness attributes of the roadless expanse. Units, 13P, 18P, and 19P propose precommercial thinning in the northeastern section of the roadless expanse. Just to the southwest of the precommercial units, there are salvage logging units (44S 45S, 58S, and 69S). Two more precommercial thinning units (36P and 39P) are located in the northwestern region of the roadless expanse analysis area. The analysis that follows considers whether, under alternative 2, any of the units described previously could have an impact on the potential wilderness attributes of roadless expanse.

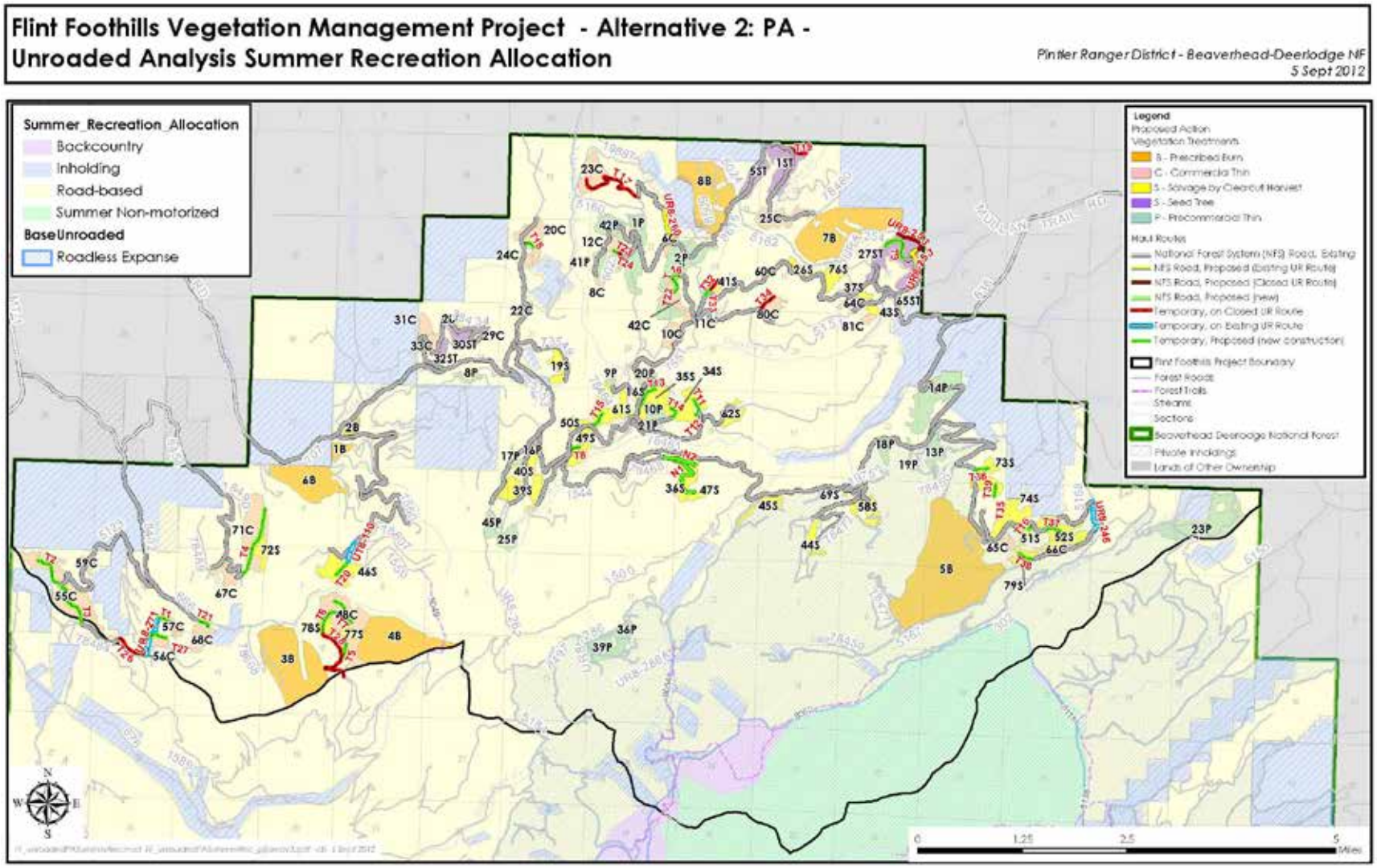


Figure 47. Flint Foothills Roadless Analysis, Alternative 2

Natural

Determine whether the area's ecological systems are substantially free from the effects of modern civilization and generally appear to have been affected primarily by forces of nature.

There may be a temporary, short-term effect on air resources across the roadless expanse in the short term. Prescribed burning can affect air quality at the time of the burning. The effects, however, are expected to be minimal and of short duration. The proposed burn unit is located in the roadless expanse, approximately 0.50 mile north of NFS Trail 8052. There would be no long-term effects to air quality in the IRA or unroaded areas because project design features and mitigation measures (chapter 2) for prescribed burning would be implemented.

The effects of the vegetation treatments on the naturalness of the unroaded expanse vary by treatment. Effects of vegetation treatments are discussed in further detail in the Vegetation section of this EIS. For the prescribed burn units, the killing of overstory and understory conifers would result in a patch mosaic which may appear similar to a small wildland fire, In the short and long term it would not be evident as to whether the fire was caused by a natural event (i.e., lightning) or was a human-caused disturbance. There would be some initial recovery of understory native vegetation that would occur shortly after the prescribed fire treatments.

Burning would also have some mixed effects on sensitive plants. For example, the moonwort species' above-ground structures could be removed by prescribed burning, reintroduction of fire would have a beneficial effect on the species in the long term. Burning is also expected to have a positive impact on the treated areas' resiliency, resulting in stands more able to withstand insect or fire mortality (Vegetation Specialist Report), which would in turn, create a more natural landscape.

The cutting units would have varied effect on the naturalness of the unroaded expanse. The precommercial thin units would not have a notable short or long term impact on the natural appearance of the unroaded expanse because they are located in a more disturbed part of the roadless expanse. The 395 acres of salvage treatments, however, would have more notable short- and long-term effect on the naturalness of the unroaded expanse. The treatments in these areas would create openings that would be obvious to the casual observer in the short and long term; these may mimic natural disturbance patterns, but the openings themselves would impact the naturalness of the area.

During implementation of vegetation treatments—salvage, precommercial thin, and prescribed burn—there would also be an impact on the natural potential wilderness characteristics of the area. This implementation impact would primarily affect southern portions of the analysis area that have more naturalness potential, particularly the IRA. These impacts would include the sights and sounds of crews working, such as running chainsaws and other logging related activities, and burning activities such as ignition with helitorches. These effects to natural character would occur during the implementation of the project only and would be short term.

Although there will be effects from the proposed vegetation treatments, there would not be an irretrievable loss of wilderness attributes.

Undeveloped

Determine the degree to which the area is without permanent improvements or human habitation. A measure of undeveloped is the level of human occupation and modification of the

area including evidence of structures, construction, habitations, or other forms of human presence, use, and occupation.

There is evidence of human manipulation already existing in parts of the roadless expanse such as roads, mining and grazing evidence (fences, stock tanks). These existing human modifications would continue to exist unchanged with the implementation of the proposed action. No additional permanent management developments are proposed for the area, so there would be no new evidence of structures, construction, habitations, or other forms of human presence, use and occupation added as a result of alternative 2. The actions proposed in alternative 2 would not affect the undeveloped component of the roadless expanse's wilderness potential in the long term.

In the short term, new temporary roads built in the roadless expanse would impact the undeveloped attribute of the expanse. On the eastern edge of the roadless expanse, the 1 mile of temporary access road (0.59 mile is new), would alter the area's undeveloped character while the roads are being built or reconstructed and used. All of the temporary roads would be decommissioned after use; the newly constructed temporary roads would be obliterated; the existing unauthorized routes would be decommissioned by sign, berms and other closure methods, as shown in table 6.

In summary, the proposed treatments would only have short-term effects on the undeveloped attributes of the roadless expanse, and the majority of those effects would occur in an area already influenced by human development. There would be no long-term impact on the area's undeveloped character. As such, the short-term effects to the undeveloped character of the area are not permanent and thus not considered an irreversible or irretrievable loss of wilderness attributes.

Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation

Determine an area's capability of providing solitude or primitive and unconfined types of recreation. This includes providing a wide range of experiential opportunities such as: physical and mental challenge, adventure and self-reliance, feelings of solitude, isolation, self-awareness, and inspiration.

Outstanding opportunities for solitude or primitive and unconfined recreation are a direct reflection of distance from and ability to detect disturbances associated with existing and/or proposed human development within the area. The actions proposed in alternative 2 would not have long-term effects on solitude or primitive and unconfined recreation attributes of the roadless expanse's wilderness potential. As described in the Affected Environment section, not all of the analysis area has opportunities for solitude and primitive recreation. Opportunities for solitude are most likely to be found in the southern portion of the analysis area, closest to the Dolus IRA. Therefore, treatment units proposed in the northern section of the analysis will not impact this attribute. The treatment unit activities in alternative 2 would have no long-term impact on the area's solitude or primitive recreation value, as most of the vegetation treatment units occur within close proximity to existing motorized roads and trails with an already low opportunity for solitude or unconfined and primitive recreation experiences (figure 47).

Alternative 2 may have a minor short-term effect on semi-primitive recreation opportunities in the roadless expanse area. The Dolus Lakes IRA and adjacent unroaded polygons within the unroaded expanse provide nonmotorized as well as some motorized recreation opportunities for visitors year-round. Semi-primitive recreation in the Dolus roadless expanse is primarily

limited to foot traffic on trails such as NFS Road 8052, which borders the IRA, as well as camping or hunting activities (figure 47). Any hunting or camping recreation is likely to be on or near roads and trails in the roadless expanse. Burn activities in Unit 5B, which is 0.30 miles from 8052, may produce short-term, localized impacts on these road and trail-based recreationists, primarily with smoke and haze. Although these activities may impact recreation in the roadless expanse in the short term, the effects are not anticipated to last beyond project implementation.

In addition, cutting units 39P and 36P may impact semi-primitive recreation in the short term by creating possible sights and sounds of treatment activities, such as chainsaw use. These units are each approximately 0.50 miles away from motorized trail 8054. Therefore, while these units would not be visible from the trail; sounds of implementation may be heard, and the trail user's viewscape may be impacted. Impacts on the recreationist's viewscape would be short term.

This alternative would produce short term effects, particularly during project implementation; however, would not cause long-term effects to the solitude attribute. As such, the proposed vegetation activities are not considered an irreversible or irretrievable loss of wilderness attributes even though they occur within the confines of the Dolus roadless expanse.

Special Features and Values

Determine the area's capability to provide other values such as those with ecologic, geologic, scientific, educational, scenic, historical, or cultural significance. Examples include unique fish and wildlife species, unique plants or plant communities, connectivity, potential or existing research natural areas, outstanding landscape features, and significant cultural resource sites. Identify and describe any such values and their contribution to Wilderness character.

The actions proposed in alternative 2 would not affect the special features attribute of the roadless expanse's wilderness potential, as there are no known special features in the roadless expanse.

Manageability

In determining capability, consider the ability to manage an area as Wilderness as required by the Wilderness Act. Section 2(c) of the Wilderness Act defines Wilderness as an area that ". (3) has at least 5,000 acres of land or is of sufficient size to make practicable its preservation and use in an unimpaired condition. . ." Forest Service ability to manage an area as an enduring resource of Wilderness, untrammeled by humans, retaining its primeval character, and to protect and manage its natural character are all factors to consider. Consider such factors as size, shape, and juxtaposition to external influences.

None of the treatments identified for the proposed action would have long-term effects on the boundary of, size or shape of, or access to the Dolus roadless expanse. None of the vegetation treatments proposed in this alternative would change any of the existing conditions regarding these factors, as all existing motorized routes would remain the same and access routes added (on the eastern edge of the roadless expanse) are temporary. Therefore, the proposed action would not have long-term effects on the wilderness manageability attribute of the Dolus roadless expanse.

Alternative 3

Direct, Indirect, and Cumulative Effects

Although the project treatment units proposed in alternative 3 vary from those in the proposed action, the vegetative units proposed in alternatives 2 and 3 are identical within the roadless expanse (table 95).

The road treatments proposed in the roadless expanse in alternative 3 vary from those in the proposed action. For alternative 3, in the roadless expanse, no new temporary road construction would occur to access to the vegetative treatment units; existing unauthorized routes would be reconstructed to access the units. Table 97 lists this road mileage for alternative 3.

Table 97. Temporary roads in roadless expanse by type in Alternative 3

Temporary Roads in the Dolus Roadless Expanse for Alternative 3	
Road type	**Miles**
New temporary road construction	0.00
Temporary roads reconstructed on existing unauthorized routes	0.39
Total temporary roads in roadless expanse	**0.39**

The effects of alternative 3 on the roadless expanse are therefore the same as described in alternative 2, with the exception of the short-term impact on the “undeveloped” attribute in alternative 2. Alternative 3 uses only existing unauthorized routes in the roadless expanse, so would therefore have no impact on the “undeveloped” value.

Cumulative Effects of Alternative 2 and Alternative 3

When considering the cumulative effects of the alternatives on the potential wilderness value of the roadless expanse, incremental impacts from past, present and reasonably foreseeable actions must be considered. Present and reasonably foreseeable actions are listed in chapter 3 (table 24). These actions were considered in combination with direct and indirect effects of proposed alternative actions, to arrive at the cumulative effects determination on the wilderness/roadless character of the roadless expanse.

Past, present, and future management activities in the project area that could impact the roadless expanse include roadside and danger tree hazard tree removal, wildland fire suppression activities, invasive plant species control, and continued livestock grazing. The cumulative effect of these activities, combined with activities proposed for alternatives 2 and 3, may affect the naturalness, undeveloped value, and feelings of solitude in the roadless expanse. These activities would take place primarily in the northern parts of the roadless expanse, away from the IRA, where the existing level of wilderness potential is already lower. Most of this area with past, present and future management activity is in a road-based recreation allocation, where these types of activities would be expected.

Management decisions such as the Beaverhead-Deerlodge Forest Plan (USDA Forest Service 2009) and travel management planning- Motor Vehicle Use Mapping (MVUM) will change the miles of roads and trails open to motorized use. This could result in a positive cumulative effect within the roadless expanse by increasing opportunities for solitude and primitive unconfined recreation.

Another management activity that has occurred in the past and will continue in the future is trail maintenance work. Trail work continues on both motorized and nonmotorized trails in the roadless expanse. Maintenance work on NFS Trail 8052, which borders the IRA, will help maintain nonmotorized trail opportunities in the southern part of the roadless expanse. This maintenance activity will likely have effects on primitive and unconfined recreation, as well as feelings of solitude. Trail maintenance is also ongoing on motorized NFS Trail 8054, which is located 0.50 miles from proposed project units for alternatives 2 and 3. This activity, when combined with project objectives, may have a positive long-term effect on the Forest's recreation resource, but as it is a motorized trail, will not add to the solitude value of the roadless expanse.

In summary, cumulative effects of past, present and reasonably foreseeable activities may affect the roadless expanse, primarily in the area in and immediately adjacent to the IRA, where there is a higher starting value for potential wilderness attributes. These effects will likely be positive and negative to the natural and undeveloped character. There would be minimal cumulative effects on wilderness/roadless attributes in the contiguous unroaded area part of the roadless expanse, due to a lower existing wilderness value condition. Cumulative effects associated with future travel management decisions may also have either positive or negative impacts on the wilderness character of this roadless expanse, as the status of additional roads or trails may change.

Summary of Effects of Alternative2 and Alternative 3

In summary, project activities would have some short- and long-term effects on the wilderness attributes for the roadless expanse from salvage by clearcut treatments and prescribed burning. The primary effects on the Dolus roadless expanse from implementing alternatives 2 or 3 would come from impacts to the IRA's naturalness value from the cutting and burning activity located near the Dolus IRA. For example, following salvage by clearcut harvest, less than 5 percent live canopy coverage would be expected to remain in the units. However, within 5 years of harvest completion, 94 percent of stands would be expected to be fully-stocked (Vegetation Specialist Report). This creates a short-term impact on naturalness, but minor long-term impact. And in the burn units, although evidence of burning would look natural, it may stand out to the observer, as it would look different from the surrounding vegetation. There would also be some short-term implementation effects from the alternatives, caused by the sights and sounds of chainsaws, other logging-related activities; and prescribed burn ignitions by hand crews or use of helitorches. Other project activities located in the northern part of the roadless expanse would produce little to no impacts on potential wilderness value, because they are located in an area with more past and ongoing management activities, where few wilderness attributes currently exist. There would also be some beneficial effects from implementing alternatives 2 or 3, including increased forest resiliency in the vegetative communities targeted for treatment. These beneficial effects are particularly applicable to the natural attribute. There would be no irreversible and irretrievable commitment of potential wilderness attributes.

Scenic Resources

Introduction

This section analyzes the scenery resource for the Flint Foothills Vegetation Project. The analysis examines the effects of the proposed treatments on the visual resources within the affected environment of the project area.

Terminology used in this analysis is defined in Agriculture Handbook #701, Landscape Aesthetics: A Handbook for Scenery Management (USDA Forest Service 1995). In addition to terminology, this handbook provides more information regarding scenery management.

Overview of Issues Addressed

None of the numerous concerns identified by the public during scoping were directed towards the scenery resources specifically. However, visual effects associated with implementation activities and how areas might appear after treatments could be considered concerns to some members of the public regardless.

Measurement Indicators

The measurement indicators used to evaluate impacts of alternatives:

- Compliance with Scenic Integrity Objectives associated with the Clark Fork Flint Landscape (Forest Plan p. 33; and Appendix A, A-1, A-4 through A-7).

Affected Environment

There are no specially designated areas within the project area boundary such as Wilderness, Wilderness Study, or Recommended Wilderness areas. A portion of the Dolus Lake Inventoried Roadless Area (I-439) is within the project area's south boundary.

Existing Condition

Effects from human activity are visible on the landscape from the transportation system network while traveling through the project area. These activities include timber harvest, mineral extraction, fire suppression, and grazing, road construction, facility construction (including buildings, communication sites, and transmission lines), developed, and dispersed recreation sites and trails. Of these, timber harvest activities have had the greatest impact on scenery because of their quantity, scale, proximity to the road system and time usually required for visual recovery.

The affected environment of the project area can be characterized as a mix of managed and naturally appearing landscapes. High mountain scenic vistas and backcountry opportunities are key attractions. Roads within the management area are primarily historic roads built to facilitate timber harvest and vegetation management activities, mining, and dam maintenance. The Flint Foothills form a scenic backdrop for Interstate 90 between Drummond and Butte, and a portion of Montana Highway 1 designated the "Pintler Scenic Loop" from Drummond south of Philipsburg (Helena 2011).

Figure 48. Typical view of Flint Foothills Management Area from Interstate 90 looking south towards project area, which is in the background distance zone (4 miles or more from viewpoint)

Figure 49. Typical view of Flint Foothills Management Area from Highway 1. The view is east towards the project area, which is in the background distance zone (4 miles or more from viewpoint).

Evidence of timber harvest and vegetation management activities are common sights within the project area, as the majority of the area has been managed for timber production, livestock grazing and dispersed recreation. Landscape settings with evidence of beetle kill are a typical sight as well (USDA 2009). As mentioned in the Vegetation section, it is estimated that 100 percent of the lodgepole pine stands with trees 5 inches d.b.h. or larger within the Flint Foothills MA on the Beaverhead-Deerlodge National Forest lands have been affected by the mountain pine beetle, causing extensive tree mortality. The following figure depicts how beetle killed trees typically appear on the high visibility landscape setting in the immediate foreground from a forest road. Note the discoloration of dead trees in contrast to those that are living. The visual effect is lowered scenic integrity.

Figure 50. Typical view of beetle-killed trees in the project area from a viewpoint along NFS Road 1544. Contrast between affected stands and those unaffected results in low scenic integrity.

Figure 51. The project area depicts a diverse landscape with a mix of natural and human impacts

The history of use and management is reflected in the developed road systems, mining sites, and scenery. Figure 51 depicts a typical view within the project area that ranges from naturally appearing to modified or managed. Note the power line running through the center of the scene and second growth clear-cut regeneration to the left. The lowland grass coverage serves as area for cattle to graze.

Foreground views in many places are of dense stands of even-aged immature trees. The effect is reduced visual penetration into the stands that can reveal positive landscape attributes and provide an open park-like condition that is preferable to viewers (Ryan 2005). The following image depicts such a condition within the Flint Foothills project area.

Figure 52. A view of dense tree stands adjacent to roadways within the project area boundary

Landscape Character

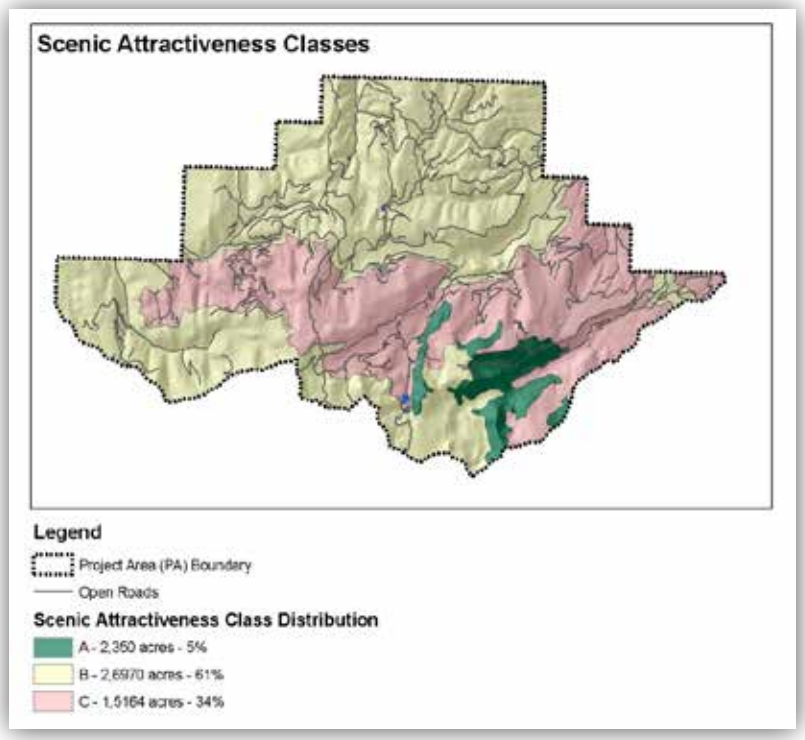
Landscape Character is defined as an overall visual and cultural impression of the landscape attributes – the physical appearance and cultural context of a landscape that gives it an identity and "sense of place "(USDA Forest Service 1995).

The overall setting provides a scenic backdrop of rugged mountains above what is known as the Southern Flint Creek Valley, where traditional ranching contributes a pastoral element to the overall character of the landscape. Lodgepole pine is the most common species on the Forest here, though all local conifers are represented.

Scenic Attractiveness

Scenic Attractiveness is the "primary indicator of the intrinsic scenic beauty of a landscape and of the positive responses it evokes in people. It helps determine landscapes that are important for scenic beauty, based on commonly held perceptions of the beauty of landform, vegetation pattern, composition, surface water characteristics, and land use patterns and cultural features" (ibid). Scenic Attractiveness is measured as Class A (Distinctive), B (Typical), or C (Indistinctive). It is important to note that the frame of reference for scenic attractiveness is the landscape character description (ibid).

Class A includes areas where landform, vegetation patterns, water characteristics, and cultural features combine to provide unusual, unique, or outstanding scenic quality within the landscape character. Class A landscapes comprise approximately 5 percent of the project area.



Class B (Typical) contains areas in which the natural and cultural features combine to create ordinary or common scenic quality. Class B landscapes comprise approximately 61 percent of the project area.

Class C (Indistinctive) contains those areas where natural and cultural features (or the lack thereof) combine to provide low scenic quality. Class C landscapes comprise approximately 34 percent of the project area.

Figure 53. Scenic attractiveness class distribution in the Flint Foothills Project area

Landscape Visibility

Landscape visibility addresses the relative importance and sensitivity of what is seen and perceived on the landscape (ibid). Landscape visibility is affected by a number of factors including context of viewers; duration of view; degree of discernible detail; and number of viewers – all which are subjective and can vary. In general, the greater the number of people likely to view a landscape and the longer the duration, the more sensitive the landscape is to modification. Landscape visibility consists of three elements – how far the viewer is from the viewing object (distance zone), travelways and use areas, and the level of concern amongst viewers of the area or object being viewed (as defined by concern level 1 and 2 routes and sites) (ibid).).

Distance Zones

The proximity of the viewer to the particular landscape affects the visibility and sensitivity; viewing distances for this analysis are:

- Immediate foreground (0 feet to 300 feet) – Built structures or facilities that serve the public offer vantage points from which scenery can be experienced from. The scenery management system regards such elements as “viewing platforms”. Roads and trails are

considered viewing platforms, and are normally (as expected) visible in this immediate foreground.

- Foreground (FG) - Views from 300 feet to one-half mile as seen from viewing platform.
- Middleground (MG) - Views from one-half mile to 4 miles from viewing platform.
- Background (BG) - Views 4 miles and greater from viewing platform (ibid)

Concern Level 1 and 2 Routes and Sites

Of particular concern to landscape visibility are travel ways such as primary highways and trails, as well as primary use areas such as campgrounds. The Scenery Management System identifies such features as Concern Level (CL) 1 and 2 viewing platforms. The Forest Plan identifies these CL 1 and 2 viewing platforms for the BDNF (Appendix A).

- Concern Level 1 - Generally includes all seen areas from primary travel routes, use areas, and water bodies where the forest visitors have a high interest in scenic qualities.

Phillipsburg, Drummond, Maxville, Garrison, Grant Kohrs Ranch, and Deerlodge are Concern Level 1 areas that surround the project area boundary; however, there are no CL 1 routes, areas, or sites within the project area. The Forest Plan identifies Montana Highway 1 (The Pintler Scenic Loop) that runs north to south along the west aspect (but outside) of the project area boundary, and Interstate Highway 90 that runs northwest to southeast along the north and west aspect (but outside) of the project area boundary as CL 1 routes. Views into the project area from either of these routes are seen as background distance zone views (i.e., 4 or more miles from view point). Refer to figure 48 and figure 49 for images of views looking towards the project area from these two routes.

- Concern Level 2 (CL 2) - Generally includes all seen areas from primary travel routes, use areas, and water bodies where the forest visitors have a moderate interest in scenic qualities or low interest in scenic qualities if the area receives moderate to high use.

There are approximately 37 miles of CL 2 routes (identified in the Forest Plan) within the project area boundary. Segments of these specific routes include National Forest System (NFS) roads 707, 302, 78615, 1557, 636 and 1544. The Douglas cabin, located within the project area boundary, is considered a CL2 site.

Figure 54 that follows depicts the concern routes and sites listed previously that are near the project area boundary.

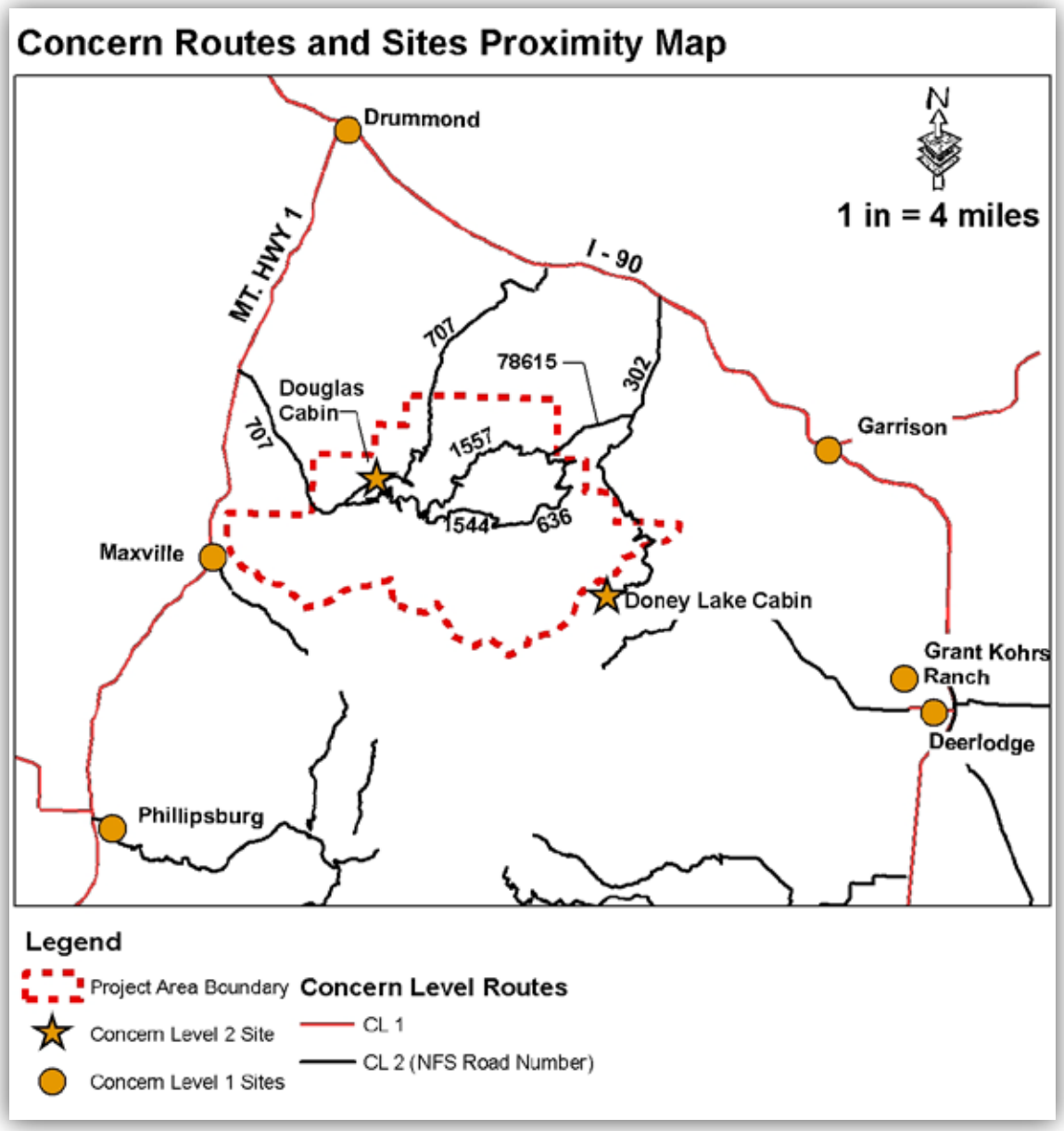


Figure 54. Concern routes and sites in the project area

Existing Scenic Integrity

Existing Scenic Integrity (ESI) is the measure of the degree to which a landscape is visually perceived to be complete. The highest scenic integrity ratings are given to those landscapes that have little or no deviation from the character valued by constituents for its aesthetic appeal. Scenic integrity is used to describe an existing situation (as with ESI), or can be applied as a standard for management. When used as a standard for management, it is a Scenic Integrity Objective (SIO). Existing scenic integrity within the project area ranges from Low to High. The following list and images help describe these ranges.

High – Human activities are not visually evident. Activities may only repeat attributes of form, line, color, and texture found in the existing attributes, qualities or traits of a landscape that give it an image and make it identifiable or unique.

A portion of the Dolus Lakes IRA as seen in figure 55 offers the only consistent High ESI setting within the project area boundary. Scenes of unmanaged landscape settings such as this are not typical within the project area.

Figure 55. Example of High ESI - View along southeastern portion of the project area boundary looking south towards a portion of the Dolus Lakes IRA.

Moderate – Human activities are evident but are visually subordinate to the attributes of the existing landscape character. They may repeat form, line, color or texture common to these characters but changes in quality, size, number, intensity, etc. must remain visually subordinate to the attributes, qualities or traits of a landscape that give it an image and make it identifiable or unique. The following figure 56 serves as an example of Moderate ESI from within the project area.

Note that the past harvest activity in the upper right aspect of the landscape is evident. However, its physical qualities closely match those of the natural openings within its surroundings, and the size of the effect is subordinate to the overall landscape setting. This view is typical of the landscape settings within the project area.

Figure 56. Example of Moderate ESI - View from within the project area along NFS Road 707 (concern level 2 route).

Low – Human activities of vegetative and landform alterations may dominate the original, natural landscape character, but should appear as natural occurrences when viewed at background distances.

Note the utility line and its corridor as it cuts through the hillside. Though this human activity his highly evident and dominates this foreground distance zone view, it would likely be unnoticeable to the casual observer when viewed as a background distance zone feature (i.e., four or more miles away from observer). Occurrences of such views are common within the project area.

Figure 57. Example of Low ESI - Photo taken from within the project area along NFS Road 1544 (concern level 2 route).

Desired Condition

The 2009 Beaverhead-Deerlodge National Forest Land and Resource Management Plan (Forest Plan) lists elements of its desired condition on page 11. The one that relates most closely to recreation and scenery states, "Visitors benefit from a range of primitive to developed recreation settings and opportunities. Most of the BDNF continues to offer uncrowded motorized and nonmotorized backcountry opportunities."

Environmental Consequences

Methodology

This analysis was completed using ArcMap and relevant Geographic Information System (GIS) data layers from the Forest. Global positioning system (GPS) tools were used to collect point data in 2011. A photo record to support existing conditions analysis is included as digital files in the project record. GIS data and tools, and field records were used in combination to determine visibility of proposed treatment activities.

The potential impacts to scenery resources from the proposed project were determined based on the site visits to the CL 1 and 2 routes and sites within and outside of the project area, review of photos of the project area, use of GIS and GPS data, and review of similar projects.

Standards

The Forest manages the scenery of its lands using concepts described under the Scenery Management System. Standards from the Forest Plan give a strict or specific set of expectations to ensure a properly managed resource.

Scenic Standards

Standards for scenic resources are found on page 33 of the Forest Plan. A summary of these standards as they pertain to the proposed action follows.

- *Standard 1: Where no minimum SIO's are identified by landscape or management area – prior to the completion of a forestwide scenic integrity map – the objectives for scenery shall be determined by procedures outlined in the Landscape Aesthetics Handbook, Agricultural Handbook No. 701. The analysis shall use the Scenic Concern Level List in Appendix A, Scenic Attractiveness GIS layer, and the Scenery Integrity Level Matrix below.*

The forest has completed the forestwide SIO map, and this layer is included in the GIS library and presented in figure 58 that follows.

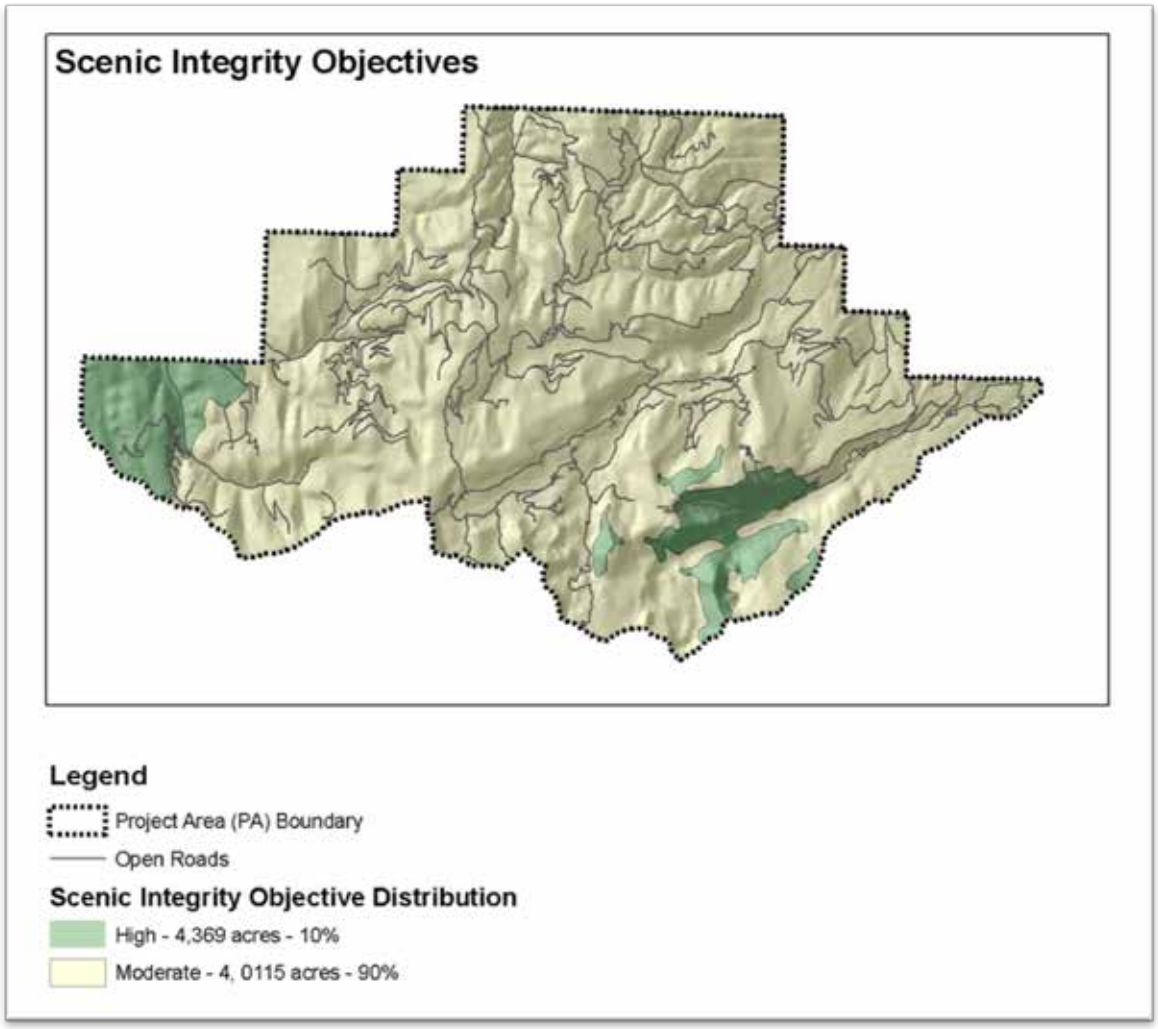


Figure 58. Scenic integrity objective distribution within the Flint Foothill Project area

- For both the Flint Foothills and Flint Uplands MAs, the appropriate SIO is High for areas visible from CL 1 viewing platforms in the foreground and middleground viewing distances, and Moderate in the background viewing distance. For areas visible from CL 2 viewing platforms within the Flint Foothills MA, the SIO is Moderate in the foreground and middleground viewing distances. For areas visible from CL 2 viewing platforms within the Flint Uplands MA, the SIO in all viewing distances is Moderate.

Moderate and High SIOs are described in the Glossary of the Forest Plan as:

- Moderate – Human activities must remain visually subordinate to the attributes of the existing landscape character. They may repeat form, line, color, texture common to these characteristics but changes in quality, size, number intensity, etc. must remain visually subordinate to the attributes, quality or traits of a landscape that give it an image and make it identifiable or unique.
- High- Human activities are not evident. Activities may only repeat attributes of form, line, color and texture found in the existing attributes, qualities or traits of landscape that give it an image and make it identifiable or unique.

Assumptions

- Analysis assumes all best management practices, project design features, or mitigation measures identified under each alterative area applied.
- All geospatial data provided by the Forest and District was accurate and the best available.

Spatial and Temporal Context for Effects Analysis

Scenery effects occur where evidence of activity can be seen. The spatial context for this analysis consists of the project area as viewed from the identified CL1 and CL2 routes and sites.

With regard to temporal context for effects to scenic resources, short term refers to the first 5-year period, beginning when all harvesting, slash treatment activities, temporary road decommissioning/obliteration, and all other project activities in an area are complete. Long term refers to time that exceeds 5 years.

Figure 59. Example of short-term effects that are within the treatment timeframe - Photos from current activity within the project area boundary

After 5 years, projects are usually complete and “green up” is beginning to occur. That is, vegetative recovery starts to mask visual signs associated with activity disturbances such as stumps left from cut trees, track and tire imprints embedded in the soil, blackened ground caused by burning, and imprint of closed and re-vegetated temporary roads. Some areas may meet adopted SIOs upon project completion; others may need time for vegetative recovery before the management objective is reached.

Figure 60. Example of long-term effects - These trees reflect visual recovery associated with a 15-year (approximate) green-up period - Photos from past activity within the project area boundary

Cumulative Effects, Past, Present, and Reasonably Foreseeable Activities in the Project Area

The existing condition of the visual resource is a result of past and current activity and is discussed in the Affected Environment section. Evidence of past activities is most noticeably powerline corridors, road alignments, infrastructure, and past harvest. The current Roadside #4 Salvage Hazard Tree Removal could produce long-term effects on a scale that could influence the current visual condition or scenic integrity objective.

For a full list of, present and reasonably foreseeable activities in the Flint Foothills Project area see table 24 at the beginning of chapter 3.

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Under alternative 1, there would be no direct, indirect, or cumulative effects on scenic resources from the Flint Foothills Vegetation Management Project because no project activities are proposed.

The existing condition would prevail, and current trends would likely continue. The mountain pine beetle is affecting the vegetation of the project area and the surrounding area. This activity would continue to affect the scenery into the future, resulting in additional dead and dying trees, demonstrated by red needles and bare, dead stems.

The high mortality of lodgepole pine and the resulting presence of trees with an obvious reddish color, seen in small pockets and large swaths throughout the landscape, would increase and have negative effects on the scenic resources within the project area. The landscape character ranges from appearing intact to slightly altered, depending on the number of dead

trees visible. In the immediate foreground and foreground viewing distances, however, the amount of dead trees can often dominate the viewshed and landscape character, negatively affecting the scenic integrity.

Visual impacts due to past harvests and road construction are noticeable throughout the project area. The no-action alternative does not worsen or improve the current visual condition for now or in the foreseeable future; so no cumulative effects are expected.

Alternative 2 – Proposed Action

Direct and Indirect Effects

The direct and indirect effects of the proposed action are measured as appropriate from identified viewing platforms (i.e. Concern Level 1 and 2 viewing platforms) that exist within and outside of the project area boundary. As mentioned in the Affected Environment section, viewing platforms within the project area boundary are comprised of the Concern Level 2 routes identified in the Forest Plan and in the Affected Environment section. These are routes where the forest visitors have a moderate interest in scenic qualities or low interest in scenic qualities if the area receives moderate to high use.

Phillipsburg, Drummond, Maxville, Garrison, Grant Kohrs Ranch, Deerlodge are Concern Level 1 areas that surround the project area boundary but the project area cannot be seen from these locations. There are no CL 1 routes, other areas, or sites within the project area boundary. The portions of the project area where treatment is proposed are not visible from the CL 1 areas due to distance and topography.

Montana Highway 1 (The Pintler Scenic Loop) is a CL 1 route that runs north to south along the west aspect (but outside) of the project area boundary, and Interstate Hwy 90 which runs northwest to southeast along the north and west aspect (but outside) of the project area boundary. Views into the project area from either of these routes are seen as background distance zone views (i.e., four or more miles from view point). No affects from these CL1 routes are anticipated because the distance, topography and sights of landscape patterns associated with the existing visual condition would obscure activity from view.

Sections of the following Concern Level 2 routes that were determined to be directly affected by the proposed actions (where the visible result of project activities would be noticed from them) are listed as follows: NFS Road 707, FR1544, FR636, and NFS Road 1557. No proposed actions (treatments) are expected to be seen from NFS Road 302 and NFS Road 78615, the remaining CL 2 routes within the vicinity of the project area. Therefore, no direct, indirect, or cumulative effects are associated with them. Proposed actions (treatments) not identified in the following analysis are not expected to be seen from any Concern Level 2 routes due to factors such as distance and obstruction or screening by terrain features and vegetation.

The direct and indirect effects of the proposed action are those related to the specific activities proposed. The following lists the actions proposed (treatment type), the units proposed, the concern level routes affected, and their anticipated effect on the existing scenic integrity for the landscape setting in which they are located.

Lodgepole Pine Salvage by Clearcut Harvest

This treatment would result in created openings in each of the units, with few trees remaining[33]. This would be perceived as a change from the current forested appearance (in spite of nearly all of the trees in these units being dead). Clearcut prescriptions have greater potential to contrast with the form, texture, line, and color from their natural, unaffected surroundings. These characteristics are consistent with lower scenic integrity. Project design features were developed to ensure that moderate scenic integrity is met by clearcut salvage treatments seen from Concern Level 2 routes within the affected environment.

Proposed salvage clearcuts (including those 40 acres or more in size) are planned for areas in a current state of lower scenic integrity or quality due to the beetle infestation. The salvage activity would not change the existing scenic integrity of these areas in the short term. The overall scenic integrity of treated areas would improve in the long term as healthy stands replace those that were dead, dying, and removed under the proposed action.

There are several units proposed for this treatment that would be visible from the identified Concern Level 2 viewing platforms. Units seen from NFS Road 1544 include: 36S, 37S, 45S, and 69S. Units seen from NFS Road 1557 include 16S, 26S, 35S, 41S, 49S, 50S, 61S, and 76S. Effects of these units are described below.

Portions of these units would be partially seen from the Concern Level 2 route section they are adjacent to. Some places along these road sections are likely to have visual screening (where stands of green trees are) between the road and unit; others would not (where stands of trees to be salvaged are located). Temporary roads are planned from NFS Road 1557, a Concern Level 2 route that would provide access to units 49S, 61S, 35S, and 41S.

Short-term effects created by activity associated with treatments (such as tractor harvest, and the people and other equipment needed to accomplish the work) would be visible directly from these associated Concern Level 2 route sections until treatment is complete. Evidence of the temporary road footprint would be difficult to see in the long-term, as the road would be obliterated upon project completion. The created openings as a result of this treatment have the potential to create visual effects that dominate the setting, but project design features would help to mitigate this. In the long term, after adequate vegetative regeneration occurs, the resulting visual condition would be consistent with that expected within the management area and meet the adopted SIO of moderate.

The following provides an estimate for the extent of foreground effects for each unit as seen from the adjacent Concern Level 2 route as well as other details that may pertain to a specific unit.

Unit 36S - The portion of this unit adjacent to NFS Road 1544 is approximately 0.36 mile in length and would be partially seen from this road section.

Unit 45S - The portion of this unit adjacent to NFS Road 1544 is approximately 0.36 mile in length and would be partially seen from this road section.

[33] In salvage units, lodgepole pine (from 4 inches up to 20 inches d.b.h.) would be salvage clearcut harvested using mechanized ground-based equipment. All other species that occur in the units (Douglas-fir, spruce, subalpine fir, and aspen) would be retained. All trees (live or dead) greater than 20 inches d.b.h. would be retained in all units. An exception would occur in harvest units if they are defined a hazard to harvest operations and designated for felling by a Forest officer.

Unit 40S – The portion of this unit adjacent to NFS Road 1544 is approximately 0.20 mile in length and flat terrain, combined with vegetation buffer between unit and road, is likely to obscure visibility into the treatment area; so this unit would be relatively unnoticed. Only haul vehicles are expected to be seen since treatment is accomplished from other Forest roads that are not identified as having visual concerns. Scenes of activity from this section of NFS Road 1544 might be noticeable in the background while treatment occurs.

Unit 69S - The portion of this unit adjacent to NFS Road 1544 is approximately 0.36 mile in length and would be partially seen from this road section.

Unit 37S - The portion of this unit adjacent to NFS Road 1557 is approximately 500 feet in length and would be partially seen from this road section.

Unit 41S - The portion of this unit adjacent to NFS Road 1557 is approximately 400 feet in length and would be partially seen from this road section since it is offset from the roadside by approximately 200 ft.

Units 35S, 16S, 61S, 50S, and 49S – These units are in close proximity to one another and the combined portion of these units adjacent to NFS Road 1557 is approximately 1.22 miles in length. Portions of all these units are expected to be visible.

Units 26S and 76S - These units are in close proximity to one another and the combined portion of these units adjacent to NFS Road1557 is approximately 0.73 mile in length. Most of the direct effects associated with this treatment method would be unseen, as these units are located on the side of the slope below NFS Road 1557. An indirect effect is that the quality of the scenic experience is improved along this road section. Trees in the immediate foreground along this road section currently screen views of the pastoral landscape setting to the north. Dead and dying trees removed here would reveal these views more, but Burn unit 7B would be more visible as a result as well. The appearance of Unit 7B would reflect a landscape setting that has been subjected to fire events of mixed severity.

Commercial Thin

This treatment would result in open stands with increased visual penetration into the stand, and emphasis on maintaining larger diameter trees. In the long term, larger trees would dominate views in the foreground, and provide for a coarse-textured tree canopy in middle- and background viewing distances. By their nature, thinning prescriptions have a lower potential for producing negative scenery effects. Thinning treatments can be designed to blend in well with their natural, unaffected surroundings as their forms are obscure, texture and color match the nature surroundings well enough to appear natural, and lines are difficult to define. These characteristics are consistent with high scenic integrity, and no mitigations are required.

Units 64C, 60C, 10C and 11C are visible from NFS Road 1557, and unit 22C is seen from NFS Road 707 (both are Concern Level 2 viewing platforms).

Unit 64C spans for approximately 300 feet directly adjacent to NFS Road 1557 where scenery is of moderate to low concern.

Unit 60C - This unit would be seen along a 0.50-mile (approximate) section of NFS Road 1557 where scenery is of moderate to low concern. An indirect effect is that the quality of the scenic experience is improved along this road section. Trees in the immediate foreground along this road section currently screen views of the pastoral landscape setting to the north. Dead and

dying trees removed here would reveal these views more. Burn unit 8B would be partially visible through the thinned stands as well, but any resulting evidence of fire treatment would be vague (i.e., darker color contrast than surrounding landscape).

Units 10C and 11C – These units are located close to one another, and would be seen along a 0.50-mile (approximate) section of NFS Road 1557 where scenery is of moderate to low concern.

Unit 22C - This unit would be seen along a 0.35-mile (approximate) section of NFS Road 707where scenery is of moderate to low concern.

This treatment would result in landscape settings with more open, park-like conditions comprised of larger stands of trees. No temporary roads are planned from this travel route, and activity associated with treatments (people, and other equipment needed to accomplish the work) would be visible directly from this section of NFS Road 1557 until treatment is complete. The resulting visual condition would be consistent with that expected within the management area and meet the adopted SIO of moderate after project completion and into the long term.

Precommercial Thin

Similar to commercial thinning, the effect of this treatment would be a reduced number of stems per acre, resulting in increased spacing between trees and increased viewing distance into these stands from the adjacent areas. This increase in visual penetration would be slight, due to the form and foliage of the trees, which still have low-growing branches.

There are several units proposed for this treatment that would be visible from the identified Concern Level 2 viewing platforms. Units seen from NFS Road 636 include 13P, 14P, 18P and 19P. Units seen from NFS Road 1557 include 20P and 43P.

These treatments would result in landscape settings with more open, park like conditions comprised of larger stands of trees. No temporary roads are planned from any of the Concern Level routes for these treatments, and activity associated with treatments (people, and other equipment needed to accomplish the work) would be visible directly from these road sections until treatment is complete. The resulting visual condition would be consistent with that expected within the management area and meet the adopted SIO of moderate upon project completion and into the long term.

The following provides an estimate for the extent of foreground effects for each unit as seen from the Concern Level Route they are adjacent to, and other details that may pertain to a specific unit not covered in the paragraph above.

Units 18P, 19P, 13P and 14P - These units are in the direct vicinity of one another, are located directly adjacent to NFS Road 636, and affect an approximate one-mile section of this road.

Unit 20P - This unit is located directly adjacent to NFS Road 1557, and totals approximately 0.40 mile of affected road section.

Seed Tree Harvest

Visual characteristics of this prescription are described in the vegetation resource report for this project as having widely spaced large-diameter ponderosa pine and Douglas-fir trees (5-15 trees

per acre) with about 400 ponderosa pine seedlings planted per acre. Shrubs and forbs would be common, but low growing.

Units 65ST and 27ST would be visible from the identified Concern Level 2 viewing platform NFS Road 1557. These units would be seen along a 0.50-mile (approximate) section of NFS Road 1557 where scenery is of moderate to low concern. The existing condition is already open and park like, with larger diameter trees dominating the foreground views. The effect of this treatment would not appear much different from what already exists, with the exception of larger openings or spacing between trees within the stands. No temporary roads are planned from this travel route, and activity associated with treatments (such as tractor harvest, the people, and other equipment needed to accomplish the work) would be visible directly from this section of NFS Road 1557 until treatment is complete. The resulting visual condition would be consistent with that expected within the management area and meet the adopted SIO of moderate upon project completion and into the long term.

Prescribed Burn

Prescribed fire is the skillful application of fire to fuels in a definite area under precisely defined conditions including wind-speed, fuel moisture, soil moisture, and other factors, in order to produce the intensity of heat and rate of spread required to accomplish specific results (Bacon 1985). Prescribed and wildfires have the power to change a landscape in ways that cause people to enjoy, dislike, or feel ambivalent about nature, depending on their personal tastes and cultural background. Aesthetics has the potential to influence fire management. Public perceptions affect land management plans and influence national regulations, so it is necessary for managers to consider the visual quality of the landscape (Fowler 2008).

There are several units proposed for this treatment that would be visible from one Concern Level 2 viewing platform - NFS Road 707. Effects to these units are described below.

Units 1B, 2B, and 6B – These units are in the same vicinity and have an approximate 200-foot buffer between NFS Road 707 and the burn unit boundary. The height and density of the vegetative buffer between the units and road would allow the lower part of these units to be relatively unnoticed by the public using the road system. However, aspects of treatment along hillsides would be noticeable. Under this alternative, treated sections within the project area boundary would be restored closer to or within their natural historic fire regimes—and serve both visually and functionally as a fire adapted ecosystem. The appearance of the landscape under this alternative would be one that reflects a forest that has been subjected to fire events of mixed severity. Evidence of crown fires may be apparent but such occurrences are expected to be infrequent since treatment would occur when weather conditions keep fire severity in check and closer to the ground. “Green up” or vegetation regeneration that would occur within a natural timeframe would enhance scenic quality.

No temporary roads are proposed for these units. This activity is consistent with practices for management or use within the management area, and both short- and long-term effects would result in meeting the adopted scenic integrity objective of moderate.

Cumulative Effects

Visual impacts due to past harvests are noticeable throughout the project area. Extensive harvest activity has occurred where allowed. This visual condition is expected in a management area that is suitable for timber harvest, and results in a moderate SIO.

Along with the proposed activities, the type of projects that could affect scenery is the current Roadside #4 Salvage Hazard Tree Removal Project. This project would benefit scenery in the short and long term by changing the low scenic integrity resulting from the uniform appearance created by acres of dead stands of trees to a scenic integrity level that is higher by offering landscape scenery that appears with more diversity and life.

The proposed activity, in conjunction with past, current, and future activities may change existing landscape conditions as seen from specific sections of CL2 routes identified in the analysis, but not in a manner that exceed Scenic Integrity Objectives in the long term. That is, areas that are of moderate SIO would remain moderate.

Summary of Effects

The visual condition would result in landscape settings that directly, indirectly, and cumulatively, remain consistent with the Scenic Integrity Objectives prescribed to the project area by the Forest Plan (2009). All pertinent standards for scenery would be followed.

Alternative 3

Direct and Indirect Effects

The direct and indirect effects to scenery as stated under the proposed action are the same for alternative 3. For units seen from CL 2 routes within the affected environment, alternative 3 proposes the same treatment prescriptions, at the same places, and employs the same harvest methods. There is one difference in what is proposed in terms of effects to scenery, and that is clear-cut salvage unit 41S. Under alternative 3, no temporary road is proposed to access the unit; therefore, no short-term effects from temporary road obliteration are anticipated.

Cumulative Effects

For units seen from CL 2 routes within the affected environment, alternative 3 proposes the same treatment prescriptions, at the same places, and employs the same harvest methods. The cumulative effects to scenery as stated under the proposed action are the same as stated for alternative 2. Collectively, actions in alternative 3, in conjunction with past, current, and future activities may change existing landscape conditions as seen from specific sections of CL2 routes identified in the analysis, but not in a manner that exceed Scenic Integrity Objectives in the long term, so there would be no cumulative effects to the moderate SIO .

Summary of Effects

The visual condition would result in landscape settings that directly, indirectly, and cumulatively, remain consistent with the Scenic Integrity Objectives prescribed to the project area by the Beaverhead-Deerlodge National Forest Land and Resource Management Plan (2009). All pertinent standards for scenery would be followed.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

All alternatives meet the goals and objectives, outlined in the 2009 Beaverhead-Deerlodge National Forest Revised Land and Resource Management Plan.

Alternatives 2 and 3 also meet the relevant Forest Plan standard. They would meet their scenic integrity objectives, if not upon project completion, in the future as described in the effects

analysis. For these action alternatives, all proposed activities seen from CL 2 platforms, are in a Moderate SIO management objective. No activity would be seen from CL 1 platforms, or in areas that have a High SIO management objective.

In some cases, Scenic Integrity Objectives would not be met immediately after management activities have been completed, but would be met at some point in the future. It is important to note that the Forest Plan (per direction provided by the Scenery Management System) does not attach timeframes to meeting Scenic Integrity Objectives. Instead, timeframes for meeting Scenic Integrity Objectives are disclosed in the project scenic resources analysis. Since all Scenic Integrity Objectives would be met, the project is consistent with the Forest Plan scenic resources standards (Forest Plan p. 33).

Heritage Resources

Introduction

This analysis examines the Heritage/Cultural Resources within the project area and discusses how these resources may be affected by the proposed activities. Cultural Resources are the physical remains of past human activities (e.g., artifacts, burials, pictographs, Native American ceremonial sites, and the remains of mining, logging, ranching and other historic activities) having scientific, prehistoric, or social values.

Affected Environment

Existing Condition

As a result of past cultural resources inventory within the Flint Foothills analysis area, 25 cultural properties were identified and recorded and three site leads were noted. One prehistoric site and 24 historic sites are recorded within the analysis area. The one prehistoric site is a pictograph. The other sites in the analysis area are historic. Seventeen historic sites are associated with historic mining activity, five log cabins, one logging activity sites, one historic Forest Service administration site, and one historic mining district. Most importantly, sixteen historic sites have cabin remains and/ wooden structural remains present. Twenty-five sites were formally recorded but only two were formally evaluated for significance in consultation with the Montana State Historic Preservation Office.

A list of documentary references that were consulted for information on the prehistoric and historic human use of the project area is provided in the Methodology section, below. The Heritage report in the project file provides more detail on past surveys in the project area.

Desired Condition

Heritage/Cultural Resource Laws and Statutes

In addition to Forest Plan direction, the following laws are the major statutes that guide and define the management of prehistoric and historic heritage sites on the National Forest System.

- The National Historic Preservation Act and its implementing regulations, particularly 36 CFR 800, Sections 106 and 110.
- The Antiquities Act
- The Archaeological Resources Protection Act

- The Native American Graves Protection and Repatriation Act
- The American Indian Religious Freedom Act
- Religious Freedom Restoration Act
- Executive Order 3175 (Indian Trust Responsibilities)
- Executive Order 13007 (Indian Sacred Sites)
- Executive Order 13175 (Coordination with Indian Tribal Governments)
- National Register Bulletin #38 (Traditional Cultural Properties)
- USFS Manual Guidance FSM 2300 (Chapter 2360)

Forest Plan Standards for Heritage Resources

The Forest Plan provides forest wide objectives (pp. 22-23) and standards (p.23) for heritage resources.

Standards relating most directly to this project:

- Standard 1: Heritage resources determined eligible for listing in the National Register of Historic Places will be preserved in place, or a consensus determination of “no adverse effect” will be reached with the Montana SHPO, the Advisory Council on Historic Preservation, and appropriate Indian tribes.
- Standard 2: Unplanned discoveries of heritage resources during project implementation shall cause project operations in the area of the discovery to cease until analysis and evaluation of the heritage resources are completed, including consultation with the Montana SHPO and appropriate Indian tribes.
- Standard 3: Heritage protection measures will be added to all appropriate contracts, sales documents, and special use permits.

Environmental Consequences

Methodology

Heritage personnel use three types of inventory strategies for this project: existing data review, sample survey, and intensive survey. Existing data review includes a basic literature review to identify previous archaeological and historic research done in the area and to determine what information previous work may have revealed. A wide array of standard references were reviewed, including the National Record of Historic Places, the Montana State Historic Preservation Plan, General Land Office Plats, Homestead Entry Surveys, Mineral Surveys, land status maps, historic Forest Service maps and professional reports, and historic monographs directly related to the archaeology and history of the Flint Foothills area.

The following documentary references were consulted for information bearing on the prehistoric and historic human use of the project area.

- The National Register of Historic Places
- The Montana State Historic Preservation Plan
- The Beaverhead Unit and Deerlodge Unit cultural site atlases, cultural site files and records of previous archaeological surveys
- General Land Office (GLO) Plats
- Homestead Entry Surveys

- Mineral Surveys
- Relevant books, articles, professional monographs on the history and prehistory of southwestern Montana and historic maps.

An examination of the existing Beaverhead-Deerlodge Heritage Program records provided information on the number and type of previously recorded cultural resource inventories and cultural sites within the analysis area. All inventories were primarily project compliance related in advance of a number of proposed federal undertakings including: timber sales, small range improvements (fences, water developments), and mining exploration and development.

Sample survey is based on the Site Identification Strategy (SIS) found in the Region I Programmatic Agreement (PA) and within the SIS is the Stratified Survey Standards (SSS). For "analysis level" (Code of Federal Regulations 800.4.b(1)) undertakings, such as the Flint Foothills project, phased Section 106 of the National Historic Preservation Act (NHPA) compliance may be completed using a sampling (as defined from Secretary of Interior Standards and Guidelines) and monitoring strategies in High-Probability areas. At the Section 106 compliance level Heritage Resource personnel will implement the SSS model for their survey methodology for specific Areas of Potential Effect (APE). The Intensive survey is a complete pedestrian examination of an entire project area of potential effect to locate and record all cultural resources. Heritage personnel would walk a compass or GPS oriented transects spaced every 20 meters for the intensive survey.

Stratification Standards and Guidelines

Archaeologists may employ a stratified sample survey for all forest undertakings where the project Area of Potential Effect is in excess of 100 acres. The stratification will include 100 percent survey of all High Probability areas, 30 percent coverage of all Moderate Probability areas, and 10 percent of all Low Probability areas. Probability areas are based on qualified intuitive assumptions. Therefore, the stratification of those probability areas is not firmly fixed and adjustments are easily made in the field.

During the 2011 field season Heritage personnel completed an existing data review, sample survey and intensive field inventory to complete the salvage, commercial thin and seed tree units except for four timber units and the prescribed burn units. Units not covered during the 2011 field season include units 55C, 59C, 68C, and 71C and all eight prescribe burn units (1B, 2B, 3B, 4B, 5B, 6B, 7B and 8B). These remaining unsurveyed timber and prescribed burn units would be field inventoried in summer 2012 using the Sample and Intensive survey strategies. The precommercial thinning units would not be surveyed by Heritage personnel. Based on the SIS, Heritage personnel determined the precommercial thinning would have no potential to cause effects on historic properties (CFR 800.3(a)(1) and CFR 800.16(y). There is no ground disturbing activity proposed and the felling of small diameter trees would not affect cultural resources.

Sites identified in the project area will be avoided and/or site specific mitigation measures would be developed in consultation with the Montana State Historic Preservation Office prior to project implementation.

Incomplete and Unavailable Information

Additional survey is needed, in 2012 for all prescribed fire units (1B, 2B, 3B, 4B, 5B, 6B, 7B and 8B) and four timber salvage and commercial thin units (55C, 59C, 68C and 71C).

Spatial and Temporal Context for Effects Analysis

The spatial context used for direct and indirect effects is limited to the areas of potential effect which are all salvage, commercial thin, seed tree, and prescribed burn treatment units, landings, new road construction, temporary road construction, and existing road reconstruction.

Cultural sites will be avoided or site-specific mitigation will be developed in consultation with the MT State Historic Preservation Office, therefore, the various proposed project activity timeframes will not affect cultural resources. There are no temporal effects identified.

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

No past or reasonably foreseeable activities would affect cultural resources. For a full list of, present and reasonably foreseeable activities in the project area, see table 24 at the beginning of chapter 3.

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Under alternative 1, there would be no direct or indirect effects to heritage resources from the Flint Foothills Vegetation Management Project because no project activities are proposed.

There are no known reasonably foreseeable actions that would reduce the heritage resource database. Other management activities that would occur in this area would need cultural resource field inventory.

Alternative 2 and Alternative 3

Direct and Indirect Effects

Under both alternative 2 and 3 there would be no direct effects to cultural resources because the area of potential effect which is the proposed activity areas including timber units (salvage, commercial thin, and seed tree), prescribed burn units, landings, temporary road construction, new road construction, and existing road reconstruction would be surveyed and sites identified prior to project implementation. The prescribed burn units would have additional survey beyond the specific delineated burn boundaries to ensure there would be no direct effects to cultural resources.

Sites would be avoided and/or mitigation measures would be developed in consultation with the Montana State Historic Preservation Office as stipulated by the Region 1 Programmatic Agreement and in accordance with Section 106 of the National Historic Preservation Act. Mitigation measures are provided in chapter 2. These mitigation measures have proven effective in the past on wildfires, managed fires and prescribed fires on the Beaverhead-Deerlodge National Forest. Over the past 20 years, no heritage resources or cultural sites have been affected where these measures have been implemented (personal communication, Joe Sampson 02/28/2012).

There would be no direct effect associated with the spring or fall prescribed burning in the commercial thin and seed tree units because heritage personnel would field-inventory the entire unit, and the trees would be whole tree yarded to a landing reducing the fuel component within the units. Fire intensity would be less and the method of burning would be ground based so

sites would be more visible, and sites would be avoided and/or mitigation measures would be developed in consultation with the MT State Historic Preservation Office prior to project implementation.

There would be no indirect effects for all the timber harvest units (salvage, commercial thin, and seed tree), prescribe burn units, and the prescribed burning of the commercial thin and seed tree units for the action alternatives because sites would be avoided and mitigation measures would be developed in consultation with the MT State Historic Preservation Office.

Cumulative Effects

Because cultural sites would be avoided and/or mitigation measures would be developed in consultation with the MT State Historic Preservation Office prior to project implementation there would be no cumulative effects for either alternative.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

All of the alternatives are compliant with the 2009 Forest Plan (USDA 2009) and compliant with relevant federal laws and regulations. Alternative 1 is compliant with the above mentioned regulations because there are no proposed project activities that would affect cultural resources, Sites with project activities for the action alternatives have been or would be surveyed, and sites would be avoided or mitigation measures would be developed in consultation with the Montana State Historic Preservation Office

Economics and Social Science

Introduction

The management of the natural resources on the Beaverhead-Deerlodge National Forest (BDNF) has the potential to affect local economies. People and economies are an important part of the ecosystem. Use of resources and recreational visitation to the national forests generate employment and income in the surrounding communities and counties. They also generate revenues returned to the Federal treasury or used to fund additional on-the-ground activities to accomplish resource management objectives.

This section presents concepts used to delineate an affected area and describes the methods and results of analyzing the economic effects of the project, including project feasibility, financial efficiency, and economic impacts. Project feasibility and financial efficiency relate to the costs and revenues of doing the action. Economic impacts relate to how the action affects the local economy in the surrounding area.

The project area is located within portions of both Granite and Powell Counties, Montana. Since these are the two counties that would be most affected by the project in terms of social and economic effects, the Affected Environment section focuses on these two counties.

The combination of small towns and rural settings, along with people from a wide variety of backgrounds, provides a diverse social environment for the geographical region around the BDNF, including the Pintler Ranger District. Local residents pursue a wide variety of life styles but many share a common theme—an orientation to the outdoors and natural resources. This is reflected in both vocational and recreational pursuits including employment in logging and

milling operations, outfitter and guide businesses, hiking, hunting, fishing, camping, and many other recreational activities.

Timber, tourism, and agricultural industries are important to the economy of local areas. Despite the common concern for, and dependence on, natural resources within the local communities, social attitudes vary widely with respect to their management. Local residents hold a broad spectrum of perspectives and preferences ranging from complete preservation to maximum development and utilization of natural resources.

Timber management activities within the project area have the potential to impact the economic conditions of local communities and counties.

Overview of Issues Addressed

Three measurement indicators and their analysis methods were selected to compare how well the alternatives are expected to meet the purpose and need.

Table 98. Economic measures of success and analysis methods

Measures of Success for Economics	Analysis Method
Available revenue	Region 1 sale feasibility spreadsheet tool – residual value analysis
Present net value	Financial efficiency analysis
Employment and labor income	IMPLAN economic impacts analysis

The preparation of NEPA documents is guided by CEQ regulations for implementing NEPA [40 CFR 1500-1508]. NEPA requires that consequences to the human environment be analyzed and disclosed. The extent to which these environmental factors are analyzed and discussed is related to the nature of public comments received during scoping. NEPA does not require a monetary benefit-cost analysis. If an agency prepares an economic efficiency analysis, then one must be prepared and displayed for all alternatives [40 CFR 1502.23].

OMB Circular A-94 promotes efficient resource use through well-informed decision making by the Federal Government. It suggests agencies prepare an efficiency analysis as part of project decision making and prescribes “present net value” as the criterion for the efficiency analysis.

The development of timber sale programs and individual timber sales is guided by agency direction found in Forest Service Manual (FSM) 2430. Forest Service Handbook (FSH) 2409.18 guides the financial and, if applicable, economic efficiency analysis for timber sales.

Many of the costs and benefits associated with a project are not quantifiable in financial terms. For example, the benefit to wildlife from habitat improvement from a project designed to maintain forests in a mosaic of diverse species and age classes resilient to insects and disease is not quantifiable in financial terms. These costs and benefits are described qualitatively in the indicated resource sections of this document. Title 40, Code of Federal Regulations for NEPA (40 CFR 1502.23) indicates:

> For the purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are qualitative considerations.

Affected Environment

Methodology

Socioeconomic measures used to describe the affected environment were obtained from the Headwater Economics' Economic Profile System – Human Dimensions Toolkit (EPS-HDT 2011), which compiles and summarizes primary population and economic data from a variety of government sources into county, multi-county or state reports. Key measures used in this analysis include land ownership, population, employment and income. Relevant excerpts from the recent Social Assessment of the Beaverhead Deerlodge National Forest written by Northern Economics (2002) are also provided to describe social conditions and preferences. Because one commenter (scoping) requested consideration of national and state level polls revealing attitudes towards logging national forests, several pertinent polls are also presented. Abundant additional information is available in the Eastern Montana National Forest Economic Assessment written by Stockmann and Stewart (2002). All of these documents are located in the project file or through the publically available EPS-HDT at http://headwaterseconomics.org/tools/eps-hdt.

Existing Condition

Project Area

The Flint Foothills Vegetation Management project area is on the Pintler Ranger District of the BDNF and is located approximately 6 miles southeast from Drummond and 28 miles northwest of Deerlodge, straddling the Granite and Powell county line. To estimate the potential effect on jobs and income, a zone of influence (or economic impact area) was delineated. The impact area was chosen using suggested USDA Forest Service protocols for delineating economic impact areas (Meti Corp 2010), which bases the selection of the impact area on commuting data and where the timber is likely to be processed (log flows). This analysis suggested that Granite and Powell Counties, Montana were the appropriate counties to include in the economic impact analysis area.

Land Ownership

More than half of the land area encompassed by the two-county impact area is managed by various public agencies, with 55 percent of the 2.6 million acres being federally owned and an additional 5 percent is owned by the state. The Forest Service manages around 1.3 million acres, or 50 percent of the land area within the impact area. Granite County has the larger share of Federal public lands (63.2 percent), and Powell County has the smaller amount (49.7 percent). By comparison, only 20.6 percent of the land area of the United States is publicly owned (figure 61).

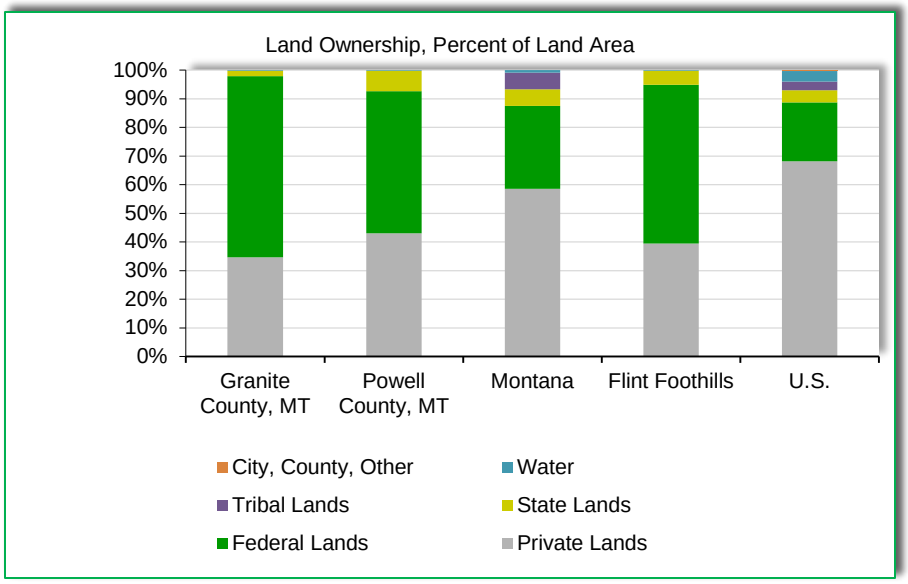


Figure 61. Land ownership by percent of land area

Source: Land Ownership 2008, Montana Natural Heritage Program

Payments from federal lands were responsible for 8.0 percent of Granite County's government revenues during 2007. This was roughly half the dependence that Powell County had on federal land payments that year, when about 15.6 percent of all their revenues came from Secure Rural Schools and Community Self Determination Funding, PILT and a few other programs.

Population and Demographic Change

According to the U.S. Census Bureau, the population of Granite County grew 13.9 percent between 1990 and 2009, while the population of Powell County grew by 6.8 percent over the same time period (table 99). Population growth in both the state and the nation outpaced the change observed in these two counties (USDC 2008).

Sources of population growth in both counties were relatively similar from 2000-2009, where both counties saw roughly two-thirds of new residents from natural growth (births-deaths) and one third from migration.

Table 99. Estimated population change 1990 to 2009

Community	1990	2000	2009	Total Percent Change
Granite County population	2,528	2,843	2,879	13.9 Increase
Powell County population	6,640	7,178	7,089	6.8 Increase
State of Montana population	800,204	903,293	974,989	21.8 Increase

Source: U.S. Census Bureau, 2009 Population Estimates, 2000 Census, 1990 Census

The racial composition of the population in the State of Montana and the analysis area in 2000 is shown in table 100. The overwhelming majority of the population across the state and within Granite and Powell Counties is white. The total population of all races other than white was less than 10 percent at both the county and state level.

Table 100. Racial composition of 2000 population

Location	White	Black or African American	American Indian, Alaskan Native	Asian, Native Hawaiian, other Pacific Islander	Other race or two or more races	Hispanic or Latino (of any race)
Montana	90.6%	0.3%	6.2%	0.6%	2.3%	2.0%
Granite County	96.3%	0.0%	1.3%	0.1%	2.3%	1.3%
Powell County	92.5%	0.5%	3.5%	0.4%	3.0%	1.9%

Source: U.S. Census Bureau, 2000 Census,

Employment

From 1970 to 2009,when the Standard Industrial Classification System was used to describe the economy, total employment for full- and part-time jobs increased by 61 percent in Granite County (from 1,139 to 1,835) and increased by 42 percent in Powell County (from 2,576 to 3,666). The State of Montana saw an increase in total employment of 107.8 percent averaging roughly 2.8 percent annually, over this same period (USDC 2011). State employment growth was largely due to increases in service and professional sector employment (including retail trade, health and social services, transportation, utilities, finance, education, etc.). Employment in the two-county impact area has consistently increased since 1970. The higher increase in employment was in Granite County, which experienced a 1.6 percent average annual rise in employment from 1970 to 2009. The lower increase was in Powell County with 1.1 percent average annual growth.

Table 101. Total employment 1970-2009

Location	Total Employment			Total Percent Increase (1970-2009)	Average Annual Percent Increase (1970-2009)
	1970	2000	2009		
Granite County	1,139	1,798	1,835	61	1.6
Powell County	2,576	3,603	3,666	42	1.1
Flint Foothills economic impact area	3,715	5,401	5,501	48.1	1.2
Montana	301,051	560,432	625,516	107.8	2.8
United States	91,277,600	165,510,200	173,809,200	90.4	2.3

(BEA 2011b)

National and regional trends in industry sectors influence the ability of communities to adapt to changing circumstances (Northern Economics 2002). Employment in extractive industries such as timber and mining, as well as in ranching and agriculture, is declining in western Montana. Projections indicate continued declines in employment in these areas. Although the differences between today's national forest timber sale program and the program that was in place a decade or so ago have changed, the role that timber production from NFS lands plays in national and regional economies through logging and related activities has existed for a considerable time period and is integral to local communities and individuals directly employed by them.

During 2009, both counties had roughly 9 percent of employment in agriculture, which were twice the Montana proportion and roughly five times the national proportion. Granite County had more than 28 percent and Powell County has just fewer than 23 percent of their 2009 jobs in sectors associated with travel and tourism. In addition, service jobs composed a larger portion of private employment in Granite County, with contrasts with Powell County where government jobs (34.2 percent many associated with the Montana State Prison) represented a larger share of employment than in Granite County, where on 14.9 percent of jobs were attributed to government. For Montana in general, the earnings from jobs in services at $32,145/year are lower than those in government, which average $41,221/year. For comparison, forestry and logging jobs paid an average of $31,239/year and wood products manufacturing jobs averaged $31,090/year for the two-counties.

The BDNF is a major employer and landholder in southwestern Montana. Consequently, Forest Service budget reductions and policies impact employment opportunities throughout the region. Jobs in the government sector decreased between 1990 and 2000 by 7.8 percent (from 34.2 to 26.4 percent in Powell County but only by 0.3 percent (from 30 to 29.7 percent in Granite County. There have been changes in the forest timber sale program over the past 15 years as objectives have changed and timber harvest levels have declined. Although the timber output amounts to only 1 percent of industry outputs in Powell County, the community of Deer Lodge (i.e., Sun Mountain Lumber) still relies heavily on timber processing for employment. While 27 percent of the industry output for Granite County came from the timber industry, the county relies heavily on private sources of timber products. The Forest Plan EIS (USDA Forest Service 2009b, p. 196) contains information about forest resource related industries and services and the declining trends in extractive industries such as timber.

Although the portion of all timber-related jobs was down from 22.4 percent during 1998 to 17.0 percent by 2009, the portion of the economy this represents was still far greater in the Flint Foothills economic impact area that the Montana state average. Of the 4,123 jobs in the state, representing 1.2 percent of the total jobs during 2009, 247 of these were located in Granite (45 or 9.5 percent of all private employment) and Powell (202 or 20.7 percent of all private employment). For Granite County the majority of these jobs were in harvesting (35) whereas in Powell County although harvesting accounted for 88 jobs, sawmills contributed more with 112 jobs in 2009. Roughly 4 jobs, 2 in each county, were attributed to other wood products manufacturing.

Despite overall growth in jobs, finding work in Granite County has been harder lately than in the past two decades. Average annual unemployment declined from 8.2 percent during 1991 to 6.5 percent during 1994. It spiked during 1995 at 7.0 percent before dropping to 5.7 percent during 1996. Then it climbed the next three years to 8.9 percent during 1999, before dropping every year until the recent low of 4.2 percent during 2006. From 2007 it climbed at an accelerating rate until 9.5 percent by 2009 before slowing its growth rate, but still climbing in 2010, reaching 10.4 percent. More recent monthly data for the early months of 2011 indicate it continued climbing.

Although recent average annual and monthly unemployment rates are at or near their highest levels in 20 years in Powell County, there is a different history for those attempting to find work there than in Granite County. Average annual unemployment increased from 5.9 percent during 1991 to 8.9 percent during 1993. After this short spike it fell until 1999 at 5.1 percent then rolled along roughly stable until 2002 at 6.2 percent dropped to its low for the period 4.7 percent during 2006. It climbed rapidly from 5.0 percent during 2007 to 8.9 percent in 2010.

More recent monthly data for the early months of 2011 indicate it continued climbing until October when monthly rates finally were lower than October 2010.

Income

Since 1970, total personal income in Granite County grew at nearly double the rate it did in Powell County. Granite County total personal income increased roughly 105 percent from 1970 to $93.742 billion by 2009, whereas in Powell County growth was 59 percent for the same period, reaching 183.063 billion by 2009. The 2009 Per capita personal income, or total personal income divided by total population was higher in Granite County ($32,561) than in Powell County ($25,823) that year. However, the 2009 average earning per job was higher in Powell County ($32,264) than in Granite County ($22,929). Part of the explanation for this inconsistency lies in the proportion of total income derived from non-labor income. Non-labor income consists of dividends, interest and rent (collectively often referred to as money earned from investments), and transfer payments (payments from governments to individuals, age-related payments, including Medicare, disability insurance payments, and retirement payments). In Granite County, 53.4 percent of all 2009 income was from non-labor sources, which was substantially higher than 46.8 percent in Powell County.

Each year the US Census Bureau releases a report on Poverty. The interactive mapping tool located at http://www.census.gov/did/www/saipe/data/maps/index.html?reload indicates that during 2010, the most recent year available, the poverty rate in Granite County, was 14.8 percent down from 17.4 percent during 2009. This is similar to the entire State of Montana, which had an estimated rate of 15.0 percent during 2009, up slightly to 15.2 percent during 2010. In Powell County it higher than the state average, at 20.5 percent during 2010, up slightly from 20.3 percent during 2009. It is worth noting that the prisoner population in Powell County partially explains the low income. It is also noteworthy that earlier in 2000, the American Indian population had a very high level of poverty in both Granite County (62.5 percent) and Powell County (30.5 percent).

Social Environment

The Forest Plan FEIS (USDA Forest Service 2009b, p. 203) includes information about the social environment of the analysis area (i.e., the lifestyles and attitudes toward forest resources and the way these resources are used). Information from the Social Assessment of BDNF (Northern Economics 2002), which identified contemporary trends affecting lifestyle, attitudes, and values, is incorporated into that discussion. Maintaining traditional uses like grazing, timber harvest, and recreational activities and maintaining the condition of forest resources for the health of the community (e.g., clean water, fish, wildlife, fuel hazards, and roadless management) were identified by the public as concerns related to lifestyle, attitudes, and values.

Excerpts from the 2002 social assessment describe some local thoughts on BDNF timber management: Section 3.2.2.1 Timber and Logging Lifestyles

> "The buckers, riggers, "cat" operators, road builders, and log truck drivers each have their own place in the logging hierarchy. Collectively they have a fierce pride in their work and describe it as a way of life that is, in part, made meaningful because of the opportunity to "work in the woods." Furthermore, the level of skills required often takes an extended period of time to learn. One of the current concerns in communities such as Clancy, Dillon, and Deer Lodge is the ongoing loss of "infrastructure" and the skill loss that accompanies that loss."

As one mill operator noted:

> "You are not just going to replace those people overnight. We are losing that infrastructure and we will not be able to replace it in a short space of time. We need to do something to keep the skills up or we will not be able to do anything with the timber if it does become available. "

These workers often describe themselves as people who care about forests and their health. As one small mill operator observed:

> "I am not an environmentalist, but I am a conservationist and I care about what happens out there. The health of the forest is important for my business and for my family's future. If we don't take care of it, then it isn't going to be there. I know I want my kids to have the same opportunity I have had to enjoy the woods and to get to know it. You learn from being close to it and it isn't something you get from a book."

The mills are now much fewer in number in project count communities than fifteen years ago. The Stoltze Mill in Dillon closed in 1990. This was among the first of many mill closures in western Montana during the 1990s. Today, there are only a few mills operating in the seven project counties (Anaconda-Deerlodge, Beaverhead, Butte-Silver Bow, Granite, Jefferson, Madison, and Powell Counties, MT). There are three general types of mills in the project area:

- The mill at Deer Lodge, typical of medium to large size mills that use spruce, fir, and pine to produce fingerjoint products, dimensional lumber and studs or plywood
- Post and pole mills that use primarily lodge pole pine to make fence posts, garden stakes, and similar products suited to small diameter timber
- Specialty mills that serve niche markets. An example of this type is the mill in Clancy that saws rough-hewn timber from fir and pine often sold to builders making "western style" homes.

Today, most of the timber processed in these mills is bought from private lands. Timber from public lands constitutes a relatively small part of the overall log supply.

Indeed, the limited amount of federal timber and its economic effects is a topic of ongoing controversy between the timber industry and those who argue that the decrease in federal timber has had negligible economic effects for western Montana communities (e.g. Power and Barrett 2001).

Although timber jobs are concentrated in only a few areas among the project counties, feelings are intense about the role of federal timber in supporting what has traditionally been an important way of life in western Montana. Although the number of persons living this lifestyle has declined, sentiments about its importance remain strong. These sentiments persist for reasons beyond our ability to explain them, but clearly they are rooted in the connection of lifestyle and place; they are connected to a wider set of concerns in western Montana about changing lifestyles resulting from in-migration and other sources of change beyond local influence (Northern Economics 2002).

Section 3.2.2.2 Resource Management Issues from the assessment specifically notes,

> "There is frustration about not being allowed to salvage dead trees.

> "If they are not going to let us go in and salvage dead trees they are not going to let us go in and cut green ones.
>
> People see the wasted wood and they are very frustrated."

Section 12.3.5 Timber Issues further presents residents feelings during 2002.

Timber cutting emerged primarily in discussion with timber and logging interests as well as some community members in towns that have or previously had lumber mills. However, timber sentiments are strongly held and rooted in the history of natural resource use in these communities. What may appear to be economic issues are also cultural issues related to the preservation of timber-related lifestyles. The themes below express the link between timber harvesting, community economies, and lifestyle values:

It is a renewable resource.

Loggers and others who visit the woods perceive an abundance of "timber supply" on public lands and advocate for "sustainable harvests. Timber is perceived as a renewable resource that can be cut and it will grow again for future generations to use. There is a sentiment that,

> "If we (the timber industry) don't take care of the resource, then it will not be there for the future."

It is a way of life.

The timber industry has been part of the history of southwest Montana since gold was discovered in the 1860s. Mills, large and small, have existed in all project counties and the timber industry has been part of the mix of the region's resource-dependent lifestyles. There is sentiment that the BDNF should be:

> "A good neighbor and support the local communities. That used to be true here. The forest supported the community. Now they have taken on an elitist attitude and they don't support us. Why did that change? There is a sentiment that good forest management creates jobs in the community."

This sentiment links forest management, lifestyles, and community support.

They need a timber program.

Timber interests perceive a need for a timber program to promote forest health and keep an infrastructure that is disappearing. Forest health is perceived to benefit by thinning and cutting dead or dying timber that can create fire danger. Overall, forest health is perceived as declining because beetle infested timber and burned trees from past fires are not being cut. For example:

> "A healthy forest is a growing forest, one that is producing fiber and creating oxygen and not building up this great biomass that is just going to burn. No one is going to get any benefit from it. Timber is one of our greatest wastes here. I feel that the BDNF is really neglecting its forests. The past ten years especially, forest health has really gone down. In the 60s and 70s maybe there was too much cutting, but now people are looking at the forests differently. Montanans are looking at forests differently. I would like to see a well-managed forest. Take out some of the diseased trees and open the forest up so there is no multi story timber canopy. Then if a fire comes through it wouldn't be catastrophic. You can't do it everywhere, but in some locations you can do that. With new logging techniques and machinery it is very low impact. It would

> improve the forest and they need to get their heads out and get a timber program going to do something about the overall health of the forest."

Forest health: periodic disturbance.

The resource user perspective on forest health deserves brief attention, since this topic emerged as a theme about forest management. This perspective may differ from that of other interest groups, but this is a thought model held by some interests group about the process for maintaining forest health. This perspective includes the idea that forest health depends on "periodic disturbance". This perspective is succinctly summarized in the following statement:

> "Forest health is a mixture of timber, brush, and grass. It is a mosaic of landscape and animals. It is diverse. It is not all green trees or all of any one thing. Some of the trees are burnt, some are snags, and there is a diversity of age classes. What you need to create this mosaic is periodic disturbance and some of that comes from timber harvesting. I think timber harvesting promotes forest health because it creates that mosaic in the landscape."

In this perspective, periodic disturbance through timber harvesting or grazing creates forest health. Forest health is expressed in a diversity or "mosaic" of species and conditions. This is a different construction of forest health than some environmental interests that perceive forest health is created by non-intervention and non-disturbance, other than "natural" disturbance.

Burned timber needs to be harvested.

Another theme that emerged in several counties is related to the salvage of burned timber. Residents, members of the forest products industry, and local government officials expressed frustration about the perceived inability of the Forest Service to salvage burned areas (Northern Economics 2002).

Relevant Montana Surveys

Comments received during scoping for this project asked that we incorporate national polls and polls from other states. While the social assessment above is useful in understanding how local people think the BDNF should be managed, looking at residents living near neighboring forests, line officers across the country, and results from randomized surveys of US citizens can help readers understand the broader interests in management of this landscape. Although this is useful information for the responsible official, it is not the intent to direct their decisions with this information alone. Responsible officials weigh all the information presented in the environmental assessment to reach their decision.

The Bureau of Business and Economic Research (BBER), at the University of Montana asked residents of two neighboring forests about this topic prior to the mountain pine beetle epidemic.

Although the cause of mortality differed, during 2001 BBER asked the following question of Bitterroot Valley residents, the national forest that adjoins the BDNF to the west and southwest of the project area:

> "In all the public lands that burned this summer, can you tell me which of the following management actions you would like the Bitterroot National Forest to take? Please rate the following choices on a scale from one to five, where one is not at all important and five is very important."

In that study, 13.2 percent of residents replied that salvaging timber, in this case killed by the large fires in the summer of 2000, was somewhat important, and 76.3 percent of residents replied that salvaging timber was very important.

During their 2002 study for the Helena NF, BBER asked residents the following:

> "The year 2000 fire season and last summer's fire season brought to attention steps that the Helena National Forest could take to manage the National Forest. Please tell me to what extent you support or oppose each of the following possible management actions in the Helena National Forest."

Results show that 72.3 percent of respondents indicated they strongly supported salvaging burned, insect infested or diseased timber, and 11.9 percent indicated they support it somewhat. On the other hand, 3.4 percent were somewhat opposed and 5.1 percent were strongly opposed. Respondents were sorted into visitors, non-visitors. In general, visitors identified as urban showed the least support, non-visitors showed more support and visitors identified as rural showed the highest amount of strong support. Respondents who did not support salvage were asked if there were conditions where they would or would not support salvage. Of those who were somewhat opposed or strongly opposed, 52 percent of them indicated no conditions exist where they could be supportive, but 38 percent said there were conditions where they would support salvaging burned or diseased timber. Roughly half of those respondents who were supportive of salvage listed, noted there were some conditions when they would be opposed. These included ill effects to ecosystem (52 percent), when activities were planned in a roadless area (20 percent) and if it involved green trees (5 percent). In addition, far more respondents to this study supported using prescribed burning than those who opposed it (Sylvester et al. 2002).

In another question from the 2002 Helena NF survey, residents were asked:

> "Recreation fees, grazing fees, timber sales and other fees on the Helena National Forest generate income for local governments and for the Federal Government. To what extent do you support or oppose generating income by selling timber from Helena National Forest?"

For all respondents, More than 35 percent somewhat support selling timber, more than 35 percent strongly supported selling timber. This contrasts more than 8 percent that somewhat oppose it and more than 9 percent that strongly oppose selling timber to from the Helena National Forest. Respondents were again sorted into visitors, non-visitors. In general, rural visitors showed the greatest support, while urban visitors and non-visitors showed similar support, and non-visitors showed the highest level of opposition. (Sylvester et al 2002).

Relevant National Polls

It is important to consider not only the local, and neighboring residents, but also the national picture. Several national level studies indicate less support for timber management on National Forests than the more local Helena and Bitterroot BBER studies presented above. For example, in an interesting repeat of a 1981 study, Brown and Harris (1992) from the University of Idaho, conducted a 1990 randomized poll of USFS District Rangers and Forest Supervisors, results show averages from numerical responses suggesting that line officers in the agency in 1990 were generally neutral to slightly unfavorable in response to the statement: Increased production of wood from National forest System lands. Using a 1-5 scale, where 1 represents favorable and 5 represents unfavorable, the mean score for District Rangers and Forest Supervisors had increased from 2.35 during 1981 to 3.91 by 1990 and from 2.21 to 3.99,

respectively. While tallies or medians from each category would have also been helpful information (a histogram of tallies gives the most information about responses and the median is not influenced as much as the mean by outliers, so comparing it to the mean helps share information about the distribution of responses), this is an interesting snapshot of the agency 31 and 22 years ago.

Eight years later or roughly 14 years ago, in June of 1998, Market Strategies, Inc. asked 800 randomly selected registered voters across the country:

> “There has been a national debate about whether the U.S. Forest Service should continue to sell timber from our national forests. Do you favor or oppose continuing to allow timber companies to log in our national forests?

The following are the 1990 results:

Strongly favor logging in our national forests:	7 percent
Somewhat favor logging in our national forests:	17 percent
Neither:	2 percent
Somewhat oppose logging in our national forests:	19 percent
Strongly oppose logging in our national forests:	50 percent
Don't know	5 percent

This study noted that even voters in the West, by a two-to-one margin (62 percent - 31 percent), oppose continuing to allow timber companies to log in national forests (Market Strategies, Inc. 1990).

Several statewide polls taken from 1996 to 2002 and two more recent national polls in 1999-2000 (American Viewpoint 2000) and 2000 (Shields et al 2002) also show low support for logging, but high support for protecting ecosystem health.

American Viewpoint who was called "a leading Republican pollster," according to a news release from the Heritage Forests Campaign and the National Environmental Trust polled 1,000 western registered voters in 6 days in late 1999 and early 2000, asking:

> "National forest lands in the United States total 192 million acres. Fifty-one percent of this land has already been logged, mined or has roads, and remains open to commercial development. Eighteen percent is permanently protected. The remaining 31 percent are wild but unprotected roadless areas. The Clinton administration has proposed to protect nearly all of these remaining wild but unprotected areas. This means it could be used for most types of recreation, but that logging, new roads, mining, oil drilling and off-road vehicles would be prohibited. Do you favor or oppose this proposal?"

The poll, focused on roadless management revealed that, by a margin of 60 to 31 percent,

> "Americans oppose allowing logging, mining and other industrial activities on national forest lands" (American Viewpoint 2000).

Shields et al. (2002) found wide support for the first goal described in the 2000 Revision of the USDA Forest Service Strategic Plan, as the public sees the promotion of ecosystem health as an important objective for public lands and such protection as an important role for the USDA Forest Service. Mixed results were found for the goal of providing multiple benefits to people. The public supports multiple uses but does not support all uses equally. Finally it should be noted that there is only moderate support for the provision of resources to dependent communities and traditional cultural uses.

Desired Condition

The Forest Plan includes the following forestwide goals and standards affecting the economics of the area:

- Contribute to the social and economic well-being of local communities by promoting sustainable use of renewable natural resources. Provide timber for commercial harvest, forage for livestock grazing, exploration and development opportunities for mineral resources, and recreation settings consistent with other resource goals (Forest Plan, p. 21).
- Forest products would be used to provide economic benefits where project objectives, forest plan objectives, and forest plan standards can be met (Forest Plan, p. 38).

Environmental Consequences

Methodology

The economic measures used for this analysis are project feasibility, financial efficiency, economic impacts, and environmental justice. These measures, including methodologies, are described below.

Project Feasibility

Project feasibility is used to determine if a project is feasible, that is, will the timber sell, given current market conditions. The determination of feasibility relies on a residual value (stumpage = revenues - costs) feasibility analysis that uses local delivered log prices and stump to mill costs to determine if a project is feasible. The appraised stumpage rate from this analysis is compared to the base rate (revenues considered essential to cover regeneration plus minimum return to the Federal treasury). The project is considered to be feasible if the appraised stumpage rate exceeds the base rates. If the feasibility analysis indicates that the project is not feasible, the project may need to be modified. Infeasibility indicates an increased risk that the project may not attract bids and may not be implemented.

Financial Efficiency

Based on comments received during scoping, all costs and revenues included in the efficiency analysis are presented in tables in this section of the analysis. The financial efficiency analysis is specific to the timber harvest and restoration activities associated with the alternatives (as directed in Forest Service Manual 2400-Timber Management and guidance found in the Forest Service Handbook 2409.18). Costs for sale preparation, sale administration, regeneration, and restoration activities are included. Costs for restoration activities are based on recent experienced costs and professional estimates. Non-harvest related costs are not included in appraised timber value but they are included in the financial efficiency analysis. All costs, timing, and amounts were developed by the specialists on the project’s interdisciplinary team. If exact costs were not known, the maximum of the cost range was used to produce the most conservative present net value (PNV) result. The PNV is the net value when expected future

costs and benefits are discounted into a single year and combined. The expected revenue for each alternative is the corresponding predicted high bid from the sale feasibility analysis. The predicted high bid is used for the expected revenue (rather than the appraised stumpage rate) since the predicted high bid is the best estimate of the high bid resulting from the timber sale auction. The PNV was calculated using a 4 percent real discount rate over the ten-year project lifespan (2013-2022). For more information on the values or costs, see the project file.

Financial efficiency provides information relevant to the future financial position of the Federal government if the project is implemented. Financial efficiency considers anticipated costs and revenues that are part of Forest Service monetary transactions. PNV is used as an indicator of financial efficiency and presents one tool to be used in conjunction with many other factors in the decision-making process. PNV combines benefits and costs that occur at different times and discounts them into an amount that is equivalent to all economic activity in a single year. A positive PNV indicates that the alternative is financially efficient. Because all planning costs are incurred prior to the line officer selecting any alternative, these are considered sunk costs and are not included in the forward looking financial efficiency analysis.

This analysis is not intended to be a comprehensive benefit-cost or PNV analysis that incorporates a monetary expression of all known market and non-market benefits and costs that is generally used when economic efficiency is the sole or primary criterion upon which a decision is made. **Many of the values associated with natural resource management are best handled apart from, but in conjunction with, a more limited benefit-cost framework.** These values such as improved mosaic of species and age classes desired for enhanced resilience to future insect and disease are discussed throughout this document, for each resource area.

Economic Impacts (Jobs and Labor Income)

Economic impacts are used to evaluate potential direct, indirect, and cumulative effects on the economy. Economic impacts are estimated using input-output analysis. Input-output analysis is a means of examining relationships within an economy, both between businesses and between businesses and final consumers. It captures all monetary market transactions for consumption in a given time period. The resulting mathematical representation allows one to examine the effect of a change in one or several economic activities on an entire economy, all else constant. This examination is called impact analysis. The IMPLAN modeling system (MIG 2003) allows the user to build regional economic models of one or more counties for a particular year. The model for this analysis used the 2010 IMPLAN data from Granite and Powell Counties, Montana.

IMPLAN translates changes in final demand for goods and services into resulting changes in economic effects, such as labor income and employment of the affected area’s economy.

The economic impact effects are measured by estimating the direct jobs and labor income generated by (1) the harvesting and processing of the timber volume from the project, and (2) Forest Service expenditures for contracted restoration activities included as part of the proposed treatments. Government work is not included in impact estimates since the work involved in this project is part of an ongoing government Agency’s vegetation management program. Data used to estimate the direct effects from the timber harvest and processing were provided by the University of Montana’s Bureau of Business and Economic Research (Morgan et al. 2007). This national data is broken into multi-state regions and is considered more accurate than that which is available from IMPLAN. The Northern Rockies BBER Region (Montana and Idaho)

is used for this analysis. The BBER data represents the results of mill censuses that correlate production, employment, and labor income.

The direct employment and labor income benefit employees and their families and, therefore, directly affect the local economy. Additional indirect and induced multiplier effects (ripple effects) are generated by the direct activities. Indirect effects are felt by the producers of materials used by the directly affected industries. Induced effects occur when employees of the directly and indirectly affected industries spend the wages they receive. Together the direct and multiplier effects comprise the total economic impacts to the local economy.

Potential limitations of these estimates are the time lag in IMPLAN data and the data intensive nature of the input-output model.

Environmental Justice

As stated in Executive Order 12898, it is required that all federal actions consider the potential of disproportionate effects on minority and low-income populations in the local region. The principles of environmental justice require agencies to address the equity and fairness implications associated with Federal land management actions. The Council on Environmental Quality (CEQ) (1997) provides the following definitions in order to provide guidance with the compliance of environmental justice requirements:

Minority population

- "Minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis..."

Low-income population

- "Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty. In identifying low-income populations, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect."

Spatial and Temporal Context for Effects Analysis

The analysis area for the efficiency analysis is the project area. It includes portions of both Granite and Powell Counties. The temporal scope of the analysis is the duration of the proposed activities. The project is expected to be accomplished over a ten-year period with the harvest activity occurring primarily in the first five years.

Timber management activities within the project area have the potential to impact the economic conditions of local communities and counties. To estimate the potential effect on jobs and income, a zone of influence (or economic impact area) was delineated. The impact area was chosen based on commuting data suggesting a functioning economy and where the timber is likely to be processed. This analysis suggested that Granite and Powell Counties were the appropriate counties to include in the economic impact analysis area.

Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

The financial efficiency of the project would not be affected by the past, present, or reasonable foreseeable future actions in the project area. Other projects occurring in the economic impact area have the potential to contribute cumulatively to jobs and labor income provided by implementing this project. A full list of present and reasonably foreseeable activities for the project area is available in table 24 at the beginning of chapter 3.

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Under alternative 1, there would be no direct, indirect or cumulative effects to the economic resource from the Flint Foothills Vegetation Management Project because no project activities are proposed. The no-action alternative has neither future costs nor revenues associated with it, and thus would have a PNV of $0. The no-action alternative contributes/maintains no jobs nor income because there are no activities associated with this alternative.

Alternatives 2 and 3

The action alternatives utilize the same vegetation treatments and units to meet the purpose and need for action. The alternatives differ by the number of units and total acreages of units for salvage by clear-cut harvest, and commercial thin of ponderosa pine and Douglas-fir stands. There is no difference in treatment acres between the alternatives for the seed tree harvest, prescribed burn and precommercial thin treatments.

Direct Effects

The estimation of project feasibility was based on the Northern Region residual value appraisal approach, which took into account logging system, timber species and quality, volume removed per acre, lumber market trends, costs for slash treatment, and the cost of specified roads, temporary roads and road maintenance. The estimated predicted high bids and minimum rates for the action alternative are displayed in table 102.

For alternative 2, the appraised stumpage of $60.43/CCF and the predicted high bid, $66.08/CCF were compared to $3/CCF minimum rates (revenues considered essential to cover the legal minimum return to the federal treasury). The predicted high bid for alternatives 2 indicates that the 40,104 CCF timber sale portion of the Flint Foothills Project would be feasible. The predicted high bid from the feasibility analysis is used in the financial efficiency analysis for each alternative discussed below. Alternative 2 could also produce 8,021 CCF of small-diameter non sawlog material which would likely be sold for $1/CCF, the minimum rate for that material. Since this would not be a mandatory element of the sale, the revenue associated with this sale is not included in the financial efficiency analysis; however a non-saw[34] adjustment was made to develop the saw log stumpage appraisal above.

For alternative 3, the appraised stumpage value of $56.61/CCF and the predicted high bid, $62.26/CCF were compared to $3/CCF minimum rates (revenues considered essential to cover the legal minimum return to the federal treasury). The estimated predicted high bids and minimum rates for the action alternative are displayed in table 102. The predicted high bid for

[34] Non-saw log or non-saw timber is less than 7 inches d.b.h. in R1 ($1/CCF); this varies in other locations. See the website where the adjustment tool is available: http://fsweb.r1.fs.fed.us/forest/sales/appraisal1/index.htm

alternatives 3 indicates that the 31,615 CCF timber sale portion of the Flint Foothills Project would be feasible. The predicted high bid from the feasibility analysis is used in the financial efficiency analysis for each alternative discussed below. Alternative 3 could also produce 6,343 CCF of small-diameter non sawlog material which would likely be sold for $1/CCF, the minimum rate for that material. Since this would not be a mandatory element of the sale, the revenue associated with this sale is not included in the financial efficiency analysis; however a non-saw adjustment was made to develop the saw log stumpage appraisal above.

Table 102. Project feasibility and financial efficiency summary (2010 dollars)

Category	Measure	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3
Timber harvest information	Acres harvested	0	2,602	2,041
	Volume harvested (CCF)	0	40,104	31,615
	Base rates ($/CCF)	$0	$3.00	$3.00
	Appraised stumpage rate ($/CCF)	$0	$60.43	$56.61
	Predicted high bid ($/CCF)	$0	$66.08	$62.26
	Total revenue (thousands of $)	$0	$2,650	$1,968
Timber harvest and required design features	PNV (thousands of $)	$0	$912	$585
Timber harvest and all other planned non-timber activities	PNV (thousands of $)	$0	-$162	-$427

Financial Efficiency

Table 102 summarizes the project feasibility and financial efficiency, including the base rates, appraised stumpage rate, predicted high bid, total revenue, and PNV for each alternative. Because all costs of the project are not related to the timber sale, two PNVs were calculated. One PNV indicates the financial efficiency for the timber sale, including all costs and revenues associated with the timber harvest and required design features. The required design features as used here include:

1. Sale preparation costs
2. Sale administration costs
3. Excavator piling and burning of activity fuel
4. Slashing damaged residuals
5. Erosion control
6. Landing rehabilitation

7. Haul route road reconstruction
8. New temporary road construction/obliteration
9. Road decommissioning
10. Road storage
11. Regeneration exams
12. Weed spraying connected with harvest
13. Weed monitoring.

A second PNV includes all costs for each alternative, including all activities listed in table 103. The costs used in the PNV calculations can be found in table 103. Table 103does not include sale preparation costs of $13.50/CCF, sale administration costs of $4.50 per CCF because they have been funded with regularly appropriated money; however these costs are used in both PNV calculations. The cost of sale preparation and sale administration for alternative 2 is $721,872. The cost of sale preparation and sale administration for alternative 3 is $570,870. These costs are captured in the efficiency analysis but not shown in the budget picture in table 7 because they would be funded with regularly appropriated dollars. Planning costs are not included in efficiency analysis since they are sunk costs at the time of decision.

Table 102 indicates that both action alternatives are financially efficient (positive PNVs) when analyzing timber sale and required design features but both become financially inefficient when the analysis includes all activities. Alternative 2 has the highest PNV for the timber sale, $912,114 and -$162,131 for all activities. For alternative 3, the PNV for the timber sale and required design features is $584,513 and -$427,481 for all activities.

A reduction of financial PNV in any alternative as compared to the most efficient solution is a component of the economic trade-off, or opportunity cost, of achieving that alternative. The no-action alternative would not harvest or take other restorative actions and, therefore, incur no costs. As indicated earlier, many of the values associated with natural resource management are non-market benefits. These benefits should be considered in conjunction with the financial efficiency information presented here. These non-market values are discussed in the various resource sections found in this environmental assessment.

Mandatory and Other Appropriated Dollar Activities

Table 103 displays the mandatory activities, their costs, and the potential available revenue for paying for those activities. The starting point for the available revenue is the estimated stumpage value from the sale feasibility analysis minus an allowance for essential regeneration costs. This stumpage value estimate is used since it is a conservative value of the timber sale.

Considering all of the mandatory activities embedded in the appraisals (First set of activities in table 103) the estimated available revenue ranges from approximately $2,423,485 for alternative 2 to $1,789,725 for alternative 3. However, not all mandatory activity costs were captured in the appraisals. For example, appraisals don’t include some direct outlays included in the project such as; 12. weed spraying connected with harvest, and 13. weed monitoring. When we add these costs, alternatives 2 and 3 are expected to produce enough revenue to pay for all of the mandatory activities. For alternative 2, once the mandatory activities are funded, there would be approximately $2,093,485 of available funds left to put towards the other activities. For alternative 3, once the mandatory activities are funded, there would be approximately $1,456,725 of available funds left to put towards the other activities.

Table 103. Activity Expenditures by Alternative (2011 dollars)

	No Action	Alternative 2	Alternative 3
Mandatory Activities Already Included in Appraisals			
3) excavator piling and burning of activity fuel	$0	$17,044	$13,171
4) slashing damaged residuals	$0	$9,022	$6,915
5) erosion control	$0	$13,075	$10,067
6) landing rehabilitation	$0	$8,981	$6,888
7) haul route road reconstruction	$0	$174,677	$138,223
8) temp road construction / obliteration	$0	$66,517	$15,105
9) road decommissioning	$0	$7,000	$4,001
10) road storage	$0	$1,200	$1,000
11) regeneration exams	$0	$45,305	$34,697
Available Revenues Based on Appraisal			
Estimated stumpage value (appraised stumpage * volume)	$0	$2,423,485	$1,789,725
Mandatory Activities Expenses Not Included in Appraisal			
12) Weed spraying	$0	$255,000	$255,000
13) Weed monitoring	$0	$75,000	$75,000
Total for Mandatory Expenses Not Included in Appraisal		**330,000**	**$330,000**
Revenue Remaining after All Mandatory Activities	**$0**	**$2,093,485**	**$1,456,725**
Other Project-Associated Activities			
14) Road maintenance BMPs	$0	$91,503	$86,783
15) Weed spraying not connected to harvest	$0	$170,000	$170,000
16) Precommercial thinning	$0	$430,728	$430,728
17) Piling and burning of non-activity fuels	$0	$150,200	$101,900
18) Manual fire line construction	$0	$1,500	$1,500
19) Lop and scatter natural fuels	$0	$30,040	$20,380
20) Prescribed fire in non-commercial areas	$0	$199,000	$199,000
21) Spot slashing for burn only treatments	$0	$15,920	$15,920
22) Interplanting	$0	$183,560	$183,560
23) Natural regeneration exams year 1 and 3	$0	$18,608	$16,352
24) Certification of natural regeneration exams year 5	$0	$13,956	$12,264
Total other project-associated activities	**$0**	**$1,305,045**	**$1,238,387**

The lower portion of table 103 displays the other activities not tied to commercial harvest and required design features. These activities would occur as funding becomes available from the timber sale revenue and other appropriated funds. The costs associated with these activities range from about $1.305 million for alternative 2 to $1.238 million for alternative 3.

Table 104indicates that conservatively estimated expected timber revenue would cover all costs for alternative 2 alternative 3. However, for conventional timber sales, a minimum of $0.25/CCF must be returned to the treasury.

Economic Impact Effects

The analysis calculated the jobs and labor income associated with the harvesting and processing of the timber products harvested as well as all contracting needed to conduct mandatory and optional stewardship activities. Timber products harvested from the proposed project and the non-timber activities would have direct, indirect, and induced effects on local jobs and labor income. In order to estimate jobs and labor income associated with timber harvest, the timber harvest levels were proportionally broken out by product type (table 104). In order to estimate jobs and labor income associated with reforestation and restoration activities, expenditures and timing for these activities were developed by the resource specialists.

Table 104. Proportion of timber harvest by product type

Product Type	Proposed Action
Sawmills	60
Log Homes	10
Post & Poles	10
Pulp	20

Table 105 displays the direct, indirect and induced, and total estimates for employment (part and full-time) and labor income that may be attributed to each alternative. Since the expenditures occur over time, the estimated impacts of jobs and labor income would be spread out over the life of the project. It is important to note that these may or may not be new jobs or income, in either case they are jobs and income that are supported by this project. These impacts are shown both in total (over the life of the project) and on an annual basis. It is anticipated that the timber harvest would occur over a five-year period, with the restoration activities spread out over ten years. Therefore, total implementation could take up to 10 years.

Table 105. Economic impacts - employment and labor income, total and annual ($2010)

Jobs and Income	**Alternatives**					
	Alternative 1		**Alternative 2**		**Alternative 3**	
Non-timber activities						
Part and full time jobs contributed	Total	Annual	Total	Annual	Total	Annual
Direct	0	0	13	1	12	1
Indirect and induced	0	0	2	0	2	0
Total	**0**	**0**	**15**	**2**	**15**	**1**
Labor income contributed ($M2010)						
Direct	$0	$0	$594	$59	$583	$58
Indirect and induced	$0	$0	$51	$5	$49	$5
Total	**$0**	**$0**	**$645**	**$65**	**$632**	**$63**
Timber harvest						
Part and full time jobs contributed	Total	Annual	Total	Annual	Total	Annual
Direct	0	0	115	23	91	18

Jobs and Income	**Alternatives**					
	Alternative 1		**Alternative 2**		**Alternative 3**	
Indirect and Induced	0	0	78	16	61	12
Total	**0**	**0**	**193**	**39**	**152**	**30**
Labor income contributed ($M2010)						
Direct	$0	$0	$5,316	$1,063	$4,204	$841
Indirect and induced	$0	$0	$2,933	$587	$2,320	$464
Total	**$0**	**$0**	**$8,249**	**$1,650**	**$6,524**	**$1,305**
All activities						
Part and full time jobs contributed	Total	Annual	Total	Annual	Total	Annual
Direct	0	0	128	24	103	19
Indirect and induced	0	0	80	16	64	13
Total	**0**	**0**	**208**	**40**	**167**	**32**
Labor income contributed ($M2010)						
Direct	$0	$0	$5,910	$1,123	$4,787	$899
Indirect and induced	$0	$0	$2,984	$592	$2,369	$469
Total	**$0**	**$0**	**$8,895**	**$1,714**	**$7,156**	**$1,368**

* Employment is the total full- and part-time wage, salaried, and self-employed jobs in the region.

**Labor income includes the wages, salaries and benefits of workers who are paid by employers and income paid to proprietors.

Alternative 2 would result in 128 direct and 208 total (direct, indirect and induced) part and full-time jobs and $5.910 million direct and $8.895 million in total labor income over the life of the project.

Of this amount, timber harvest and processing in alternative 2 would contribute 115 direct and 193 total jobs during the five years, with $5.316 million direct and $8.249 million in total labor income. Annually this means a contribution of 23 direct and 39 total jobs and $1.06 direct and $1.65 million in total labor income. If the implementation takes longer than anticipated, the total impacts would remain the same, but the annual contributions would be reduced.

The precommercial thin, prescribed burn and other project-related resource activities proposed in alternative 2 would contribute approximately 13 direct and 15 total part and full-time jobs during the ten years. This contribution would entail $594,000 direct and $645,000 in total labor income. Annually, this would mean a contribution of roughly 1 direct and 2 total jobs and $59,000 direct and $65,000 total labor income performing restoration activities.

Alternative 3 would result in 103 direct and 167 total (direct, indirect and induced) part and full-time jobs and $4.787 million direct and $7.156 million in total labor income over the life of the project.

Of this amount, timber harvest and processing in alternative 3 would contribute 91 direct and 152 total jobs during the five years, with $4.204 million direct and $6.524 million in total labor income. Annually this means a contribution of 18 direct and 30 total jobs and $841,000 direct

and $1.305 million in total labor income. If the implementation takes longer than anticipated, the total impacts would remain the same, but the annual contributions would be reduced.

The precommercial thin, prescribed burn and other project-related resource activities proposed in alternative 3 would contribute approximately 12 direct and 15 total part and full-time jobs during the ten years. This contribution would entail $583,000 direct and $632,000 in total labor income. Annually, this would mean a contribution of roughly 1 direct / total jobs and $58,000 direct and $63,000 total labor income performing restoration activities.

Environmental Justice

Environmental Justice is discussed in the Forest Plan EIS (USDA Forest Service 2009b, p. 206). According to the CEQ's Environmental Justice Guidelines for NEPA (1997), "minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis." Table 100 shows that the total share of all minority populations represented less than 10 percent of the population in the state and the analysis area in 2000. Thus, the U.S. Census data suggest minority populations within the analysis area do not meet the CEQ's Environmental Justice criterion.

CEQ guidance on identifying low-income populations states that "…agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (e.g., migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect." Low-income populations are defined, based on the 2000 Census standard, as persons living below the poverty level (based on total income of $13,359 for a family household of four). Persistent poverty status requires a county to have experienced an individual poverty rate in excess of 20 percent for several Census years. In 2010, 14.8 percent of the population in Granite County and 20.3 percent of the population in Powell County were living below the poverty level. In the case of Granite County this was down from 2009, whereas for Powell County it was slightly higher than 2009. Based on these data, the characteristic of persistent poverty may be present in Powell County, part of the analysis area. As noted above, the State of Montana prisoner population in Powell County partially explains the low income.

Summary of Effects

The decision maker takes many factors into account to facilitate the decision. The use of efficiency measures is one tool used when evaluating trade-offs. Many things cannot be easily quantified with dollars, such as effects on the vegetation. Table 106 indicates how well each of the alternatives makes progress towards the purpose and need established for the Flint Foothills Vegetation Management Project.

Table 106. Summary Trade-off Analysis Table

Objective	Performance Measures	Alternative 1	Alternative 2	Alternative 3
A	Stands already in a managed condition managed to maintain long term sustained yield (acres)	0	1,048	1,048
A	Volume of timber harvested (CCF)	0	32,083-40,014	25,372-31,715
B	Increases in the 0 to 5 inch d.b.h.	0	2,775	2,634

Objective	Performance Measures	Alternative 1	Alternative 2	Alternative 3
	class (acres)			
B	Reduction in forest density in large size classes of dry forest communities (acres)	0	1,880	1,397
	Economic measures	**Alternative 1**	**Alternative 2**	**Alternative 3**
	Revenue generated*	$0	$2,423,485	$1,789,725
	Purchaser costs		$331,425	$ 331,425
	Estimated program costs**		$721,872	584,513
	Present net value (Timber harvest and required design features, Forest Service perspective)	$0	$912,114	$584,513
	FS Costs***		$1,634,953	$1,573,045
	Present net value (All activities, Forest Service perspective)	$0	($162,131)	($427,481)

*Revenues are conservatively estimated by multiplying stumpage value, after reducing stumpage to residual value accounting for several costs.

**Includes sale preparation and sale administration, covered with regular appropriations.

***Cost not included in appraisal as detailed provided in Table 7, called “mandatory expenses not included in the appraisal” and “other” costs.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

All alternatives comply with applicable Forest Plan, as well as other relevant laws, regulations, policies and plans.

Short-term Uses and Long-term Productivity

NEPA requires consideration of “the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR 1502.16). The resource sections in chapter 3 disclose the short-term and long-term environmental impacts. Implementation of the alternatives would involve tradeoffs between long-term productivity and short-term uses of the environment including the short-term disturbances of soils that could cause sedimentation to area streams, or biological resource impacts from habitat disturbance. Conversely, the treatments would have a positive benefit to the long-term productivity of the treatment stands. Impacts would be mitigated by project design features and mitigation measures (chapter 2) including BMPs. No significant losses in long-term productivity have been identified as a result of this project.

Unavoidable Adverse Effects

The resource sections of chapter 3 disclose the environmental consequences, including unavoidable adverse effects related to implementation of the alternatives. The analysis in this document used the best available information to estimate environmental impacts; conservative assumptions were made to estimate effects where information was unavailable. The severity of the effects would be minimized by the project design features and mitigation measures (chapter 2).

Irreversible and Irretrievable Commitments of Resources

NEPA requires a discussion of "any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented" (40 CFR 1502.16).

An irreversible commitment of resources refers to the loss of non-renewable resources that cannot be regained over time, such as the removal of mined ore or extinction of a species. An irretrievable commitment applies to the loss of production or use of renewable resources for a period of time, such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line right-of-way or a road.

The impacts described in chapter 3 involve irretrievable commitments of resources, including short-term loss of productivity in areas cleared for road and landings; and detrimental soil disturbance on areas compacted by logging operations. Growth of forest vegetation would be affected during the time the roads and landings are used for logging operations, up to 5 years (length of the timber contract); the new temporary roads would be obliterated after completion of the logging activities. The 1.3 miles of NFS road construction in the proposed action would affect productivity long term on approximately 6 acres. The compacted soil areas would be rehabilitated after logging by subsoiling, so there would be a nominal lag in growth of forest vegetation in these areas. The action alternatives would not jeopardize the continued existence of any species.

Chapter 4. List of Preparers

List of Preparers

Beaverhead-Deerlodge National Forest

Joe Brabender	Air Quality
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Consultation

The Forest Service consulted the following federal and state agencies and tribes during the development of this environmental impact statement.

Federal, State, and Local Agencies:

USDI Bureau of Land Management, Missoula, MT
USDI Fish and Wildlife Service, Helena, MT
Montana Department of Natural Resources, Anaconda, MT

Tribes

Confederated Salish & Kootenai Tribes Tribal Historic Preservation Office
Shoshone-Bannock Tribe Cultural Program

Distribution of the Environmental Impact Statement

This environmental impact statement has been distributed to individuals who commented during the first and second rounds of scoping and those requesting to be on the mailing list. In addition, copies have been sent to the following federal agencies or other agencies notified of availability; federally recognized tribes, state and local governments and organizations.

United States Environmental Protection Agency

United States Environmental Protection Agency, Region 8, Montana Office

Fish, Wildlife and Parks Region 2 Office

Montana Department of Environmental Quality

Montana Historical Society, SHPO

Shoshone-Bannock Tribes

Granite County Board of Commissioners

Powell County Board of Commissioners

Alliance for Western Rockies

Native Ecosystem Council

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Glossary

Active Crown Fire ~ A fire that moves into and through the tree crowns, generally due to a combination of fire intensity and ladder fuels

Activity Fuels ~ Fuels created by management actions

Allelopathy ~ The inhibition of growth in one plant species by chemicals produced by another. For example, other plants will often not grow underneath black walnut trees, since these trees produce juglone, a chemical inhibiting plant respiration.

Anadromous Fish ~ Species of fish that are born in freshwater, move to the ocean to mature, and return to freshwater to reproduce

Aquatic ~ Living or growing in water

Aquatic Conservation Strategy (ACS) ~ A strategy "developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands"

(USDA Forest Service and USDI Bureau of Land Management 1994b, B-9)

Aquatic Conservation Strategy Objectives ~ Objectives that "define the context for the agency review and implementation of management activities. Complying with the Aquatic Conservation

Strategy objectives means that an agency must manage the riparian-dependent resources to maintain the existing condition or implement actions to restore conditions. The baseline from which to assess maintaining or restoring the condition is developed through a watershed analysis. Improvement relates to restoring biological and physical processes within their ranges of natural variability." (USDA Forest Service and USDI Bureau of Land Management 1994b, B-10)

Beneficial Uses ~ "Beneficial uses" of the waters of the state that may be protected against water quality degradation include, but are not necessarily limited to, domestic, municipal, agricultural, and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves (from Section 13050(f) of California's Porter-Cologne Water Quality Control Act)

Best Management Practices (BMPs) ~ Measures certified by the State Water Quality Control Board and approved by the Environmental Protection Agency as effective means of reducing water quality impacts from non-point sources of pollution

Board Foot ~ A unit of measurement equal to an unfinished board one-foot square by one-inch thick

Burn Severity ~ Effects of fire on the soil surface; related to fire intensity and duration

Canopy: Tree crowns in a stand

Canopy Base Height ~ The distance from the ground to the base of the tree crowns (usually an average value for a stand)

Channel Morphology ~ the study of the form (shape) and physical characteristics of a stream channel.

Classified Road ~ Roads wholly or partially within or adjacent to National Forest System lands that are determined to be needed for long-term motor vehicle access, including State roads, county roads, privately owned road, National Forest System roads, and other roads authorized by the Forest Service

Coarse Woody Debris (CWD) ~ Woody material at least 20-inches in diameter from whatever source that is dead and lying on the forest floor. Term used for terrestrial species habitat. See Large Woody Debris for aquatic species habitat

Compacted Soils ~ Soils with reduced porosity

Critical Habitat ~ Defined in the ESA as (1) the specific areas within the geographical area occupied by the species, at the time it is federally listed, on which are found those physical or biological features essential to the conservation of the species, and which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed, when it is determined by the Secretary of the Interior that such areas are essential for the conservation of the species

Crowning ~ Situation where fire rises to the tree tops and begins advancing from tree top to tree top, or where fire intermittently ignites tree crowns as a surface fire advances.

Cumulative Effects ~ Those effects resulting from incremental effects of actions, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions

Cumulative Watershed Effects Model ~ A model for Cumulative Watershed Effects with three components: Equivalent Roaded Acres (ERA), sediment delivery from surface erosion, and sediment delivery from mass wasting. The model quantifies disturbances and land sensitivity at the 7th field watershed scale and can calculate them at larger scales. The estimated results fall on a continuum. As disturbances increase over time and space, at some point the risk of initiating or contributing to existing adverse cumulative watershed impacts becomes a cause for concern. Concern thresholds have been identified for each component based on field observations in the Forest

Diameter Breast Height (d.b.h.) ~ The diameter of a standing tree at a point 4½ feet above ground level, measured from the uphill side.

Direct Effects ~ Those effects occurring at the same time and place as the initial cause or action.

Dispersal ~ The relatively permanent movement of individual animals from one location to another. Usually dispersal is the movement of young animals from where they were born to a site where they eventually settle to breed

Ecosystem ~ A dynamic community of biological organisms, including humans, and the physical environment with which they interact

Effects ~ Impacts; physical, biological, economic, and social results (or expected results) from implementing an activity

Embeddedness ~ Degree to which large streambed materials such as cobbles and gravel are surrounded or covered by fine sediment

Endangered Species ~ Designated by the United States Fish and Wildlife Service or NOAA Fisheries, an animal or plant that has been given Federal protection status because it is in danger of extinction throughout all or a significant portion of its natural range.

Environmental Justice: Executive Order 12898 requires an assessment of whether minorities or low-income populations would be disproportionately affected by proposed actions

Equivalent Road Acres (ERA) ~ An index of average watershed disturbance expressed in road equivalent acres relative to a “threshold of concern” assigned for the watershed.

Erosion: A general term for movement of soil particles on the surface of the land initiated by rainfall and running water. This includes surface erosion and channel erosion, as opposed to landsliding

Filtering Capacity ~ Ability of a riparian reserve to trap sediment and prevent it from reaching a stream.

Fine Fuels ~ Fuels less than 3 inches in diameter that is easy to ignite

Fire Behavior ~ The manner in which a fire reacts to fuels, weather, and topography

Fire Intensity ~ A general term relating to the heat energy released in a fire

Fire Regime ~ The combination of fire frequency, predictability, intensity, seasonality, and distinctive characteristics of fire in an ecosystem; Agee (1993) defines three broad categories of fire severity "based on the physical characters of fire and the fire adaptations of vegetation"

Fishery ~ the total population of fish in a stream or body of water and the physical, chemical and biological factors affecting that population.

Global Rank ~ global rank of 2 (G2), which means imperiled due to rarity or with very restricted range, i.e., vulnerable to extinction. Trend monitoring of all G1, G2, and G3

Imminent Mortality ~ Mortality is imminent when the majority of the root system is destroyed and the remaining roots can no longer support the remaining live portions of the tree (Thies and Sturrock 1995). We define "imminent" as likely to occur in several months to, possibly, a few years (up to five). Similarly, mortality is imminent in trees with destroyed portions of crowns and thus with greatly diminished ability to supply adequate quantities of carbohydrates to the bole and roots. Imminent mortality occurs when the carbohydrate budget is in deficit; respiration exceeds photosynthesis, and stored carbohydrate reserves become exhausted (Waring 1987).

Key Watersheds ~ Fish Key Watersheds are watersheds selected for focusing federal funds and personnel for the purpose of protecting, restoring, or maintaining viability of Threatened, Endangered and Sensitive aquatic species. Restoration Key Watersheds are watersheds selected for focusing federal funds and personnel for the purpose of accelerating improvements in water quality and watershed conditions.

Low Severity Fire Regime ~ Effect of typical fire is benign; fires are frequent (often < 20 years), of low intensity, and the ecosystems have dominant vegetation well-adapted to survive fire

Mixed Severity Fire Regime ~ Fires are of intermediate frequency (25-100 years), range from low to high intensity, and have vegetation with a wide range of adaptation

High Severity Fire Regime ~ Fires are usually infrequent (often >100 years) but may be of high intensity, most vegetation is at least top-killed

Fire Return Interval ~ Number of years between two successive fire events in a given area.

Fire Risk ~ The statistical probability of a fire start occurring over a ten-year period for a given thousand-acre area

Fire Severity ~ The degree to which a site has been altered or disrupted by fire; severity is affected by fire intensity and how long the fire remains at the site. In this document, fire severity is defined as tree mortality

Fire Suppression ~ All work and activities associated with extinguishing a fire

Force Account ~ Term used to refer to Forest Service personnel and equipment

Forest Plan (LRMP) ~ The Klamath National Forest Land and Resource Management Plan, approved in 1995. The Forest Plan provides land allocations, Standards and Guidelines, and direction for management of the Klamath National Forest.

Fuel Loading ~ The quantity of fuel per acre in a given area

Fuel Treatment ~ The process of removing and/or modifying natural or human created fuels to reduce fire hazard and achieve other resource objectives

Fuels ~ Anything within the forest that will burn; usually live and dead woody vegetation

Full-Bench Skid Trails ~ For ground-based equipment skid trails, the entire road surface is cut into the hill slope

Geographical Information System Coverage ~ Data layer in a Geographical Information System.

Grapple System ~ A mechanical method of piling fuels using an articulating arm on a low ground pressure vehicle that picks up the material and places it on the pile

Green Tree Retention ~ A regeneration cut in an even-aged silvicultural system that maintains a portion of the existing stand, creating a two-storied structure with two or more age classes present

Ground-based Equipment ~ Equipment that runs on the ground, like tractors, rubbertired skidders, and masticators

Group Selection ~ Harvest treatment in an uneven-aged silvicultural system that removes small groups of trees, resulting in different age classes in the stand

Habitat ~ The place where a plant or animal lives and grows under natural conditions

Head of Fire ~ Advancing edge

Hydrologic ~ Dealing with the movement and properties of liquid water in environmental systems. Includes the circulation patterns of water in the biosphere from condensation and precipitation to movement both on and under the ground surface to evaporation back into the atmosphere

Hydrologic Recovery ~ Harvested timber stand with sufficient canopy closure that snow accumulation, melt rates, and soil protection from raindrop impact are comparable to pre-harvest levels; this typically is achieved when the average tree size is 8” diameter breast height or 35 feet tall. Recovery is complete by around 30 years after harvest on the westside of the Forest

Hydrologic Unit Code (HUC) ~ A coding system developed by the U.S. Geological Service to map geographic boundaries of watersheds by size.

Impacts ~ Physical, biological, economic, and social results (or expected results) from implementing an activity

Incorporation by Reference ~ A technique used to cut down on the bulk in environmental documents without impeding agency and public review of the action. The material included as part of the document must be cited in the document and its content briefly described

Indirect Effects ~ Those effects occurring later in time or that are spatially removed from the activity

Inference Point ~ The midpoint of a zone where disturbances become great enough to cause concern about initiating or contributing to adverse cumulative watershed effects

Infiltration (soil) ~ The movement of water through the soil surface into the soil

Interdisciplinary ~ The utilization of individuals representing two or more areas of knowledge and skills focusing on the same subject

Irretrievable ~ An irretrievable commitment of resources entails a loss of production, harvest, or use of natural resources. Such decisions are reversible, but the production opportunities foregone are irretrievable (50 Federal Register 26082)

Irreversible ~ An irreversible commitment of resources entails a loss of future options. This applies primarily to the effects of use of non-renewable resources such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over a long period of time (50 Federal Register 26082)

Issue ~ Point of discussion, debate, or dispute about the environmental effects of the proposed action

Ladder Fuels ~ Small trees and brush in the understory that allow fire to move from the ground into the tree crowns

Land Allocation ~ The assignment in the LRMP of a management emphasis to particular land areas with the purpose of achieving goals and objectives

Late-successional characteristics ~ Characteristics of a stand of trees indicative of maturity, including mature and overmature trees in the overstory; multi-layered canopy with trees of several age classes; and standing dead trees and down material

Late-successional habitat ~ Older forested stands with moderate to high canopy closure; often containing a multilayered, multispecies canopy dominated by large overstory trees; large trees with broken tops or other indications of old and decaying wood; numerous large snags; and moderate to heavy accumulations of large logs on the ground

Late-successional stands ~ Late-successional stands within the Project Area are defined as stands with an average DBH > 24". On the north and east facing slopes, theses stands contain a mix of conifer species and generally exhibit complex structure and abundant DWD. Late-successional stands on south and west facing slope, are typically more open and pine dominated with less DWD. True fir late-successional stands are generally single storied with little understory

Late-successional reserves (LSR) ~ Large blocks of habitat that are distributed across the range of the northern spotted owl and spaced closely enough to facilitate dispersal of owls. Late-successional reserves are managed to provide habitat for late successional and “old growth” species

Management Area (MA) ~ A distinct geographical area with specified objectives and prescriptions

Management Direction ~ A statement of multiple use and other goals and objectives, along with the associated management prescriptions and Standards and Guidelines to direct resource management

Management Indicator Species(MIS) ~ "Certain vertebrate and/or invertebrate species present in the area…. selected because their populations changes are believed to indicate the effects of management activities…additional plant or animal species selected because their population changes are believed to indicate effects of management activities on other species of selected major biological communities or on water quality." (CFR 219.19(a)(1)). Designation does not infer a special degree of protection in or of itself.

Mass Wasting ~ Movement of soil material in landslides and debris torrents

Masticator ~ Equipment that grinds or chews up vegetative material

Matrix ~ Lands outside of reserves and withdrawn areas; lands assigned a regulated timber yield

Monitoring ~ Process of collecting information to evaluate if objective and anticipated or assumed results of a management plan are being realized or if implementation is proceeding as planned

Montane ~ Pertaining to mountain conditions

National Environmental Policy Act (NEPA) ~ The act that governs how federal agencies assess impacts of management actions on public lands. The process is interdisciplinary and requires consideration of the environmental effects of alternatives and disclosure of those effects.

National Forest System Road ~ A classified Forest road under the jurisdiction of the Forest Service. The term "National Forest System Roads" is synonymous with the term "forest development roads" as used in 23 U.S.C. 205

Noxious Weed ~ Any plant so designated by the Weed Control Regulations and identified on a regional district noxious weed control list. They are generally non-native and resistant to control efforts

Overstory ~ The portion of trees in a forest which forms the uppermost layer of foliage

Passive Crown Fire ~ A fire that remains on the ground surface but exhibits some individual tree or group torching; fire intensity is still fairly low

Peak Flow ~ The greatest stream or river flow occurring in a year from a single storm event

Properly Functioning Condition (PFC) ~ Ecosystems are in PFC when they function within their historic range of variability.

Rain-on-Snow Event ~ Rain falling on a snowpack and rapidly melting the snow, causing the melt water to be added to the rain, creating flood conditions

Reach ~ A segment of stream.

Record of Decision ~ A document separate from but associated with an environmental impact statement that states the management decision and provides the rationale for that decision

Reforestation ~ The natural or artificial restocking of an area with trees

Residence time ~ The amount of time required for a fire front to pass a stationary point. Longer residence times result in greater resource impacts

Residual ~ The trees remaining after harvesting; also known as the crop trees

Resilience ~ An ecosystem's ability to maintain structure and patterns of behavior in the face of disturbance

Rill ~ Very small streams occurring during or directly after precipitation, especially on bare soil, often creating a temporary gully and causing rill erosion

Riparian ~ In general, characterized by being situated on the bank of a river or other body of water; in ecology, the term is applied both to species that live near streams and to the area adjacent to streams where vegetation and microclimate are influenced by the presence of the stream

Riparian Reserves (Riparian Reserves) ~ A land allocation in the LRMP that includes an aquatic ecosystem and the adjacent upland areas directly affecting it. It also includes unstable and potentially unstable lands that are not associated with aquatic areas. Specific Standards and Guidelines provide direction for these areas as outlined in Management Area 10 of the LRMP

Riparian Area/Habitat ~ Land where the vegetation and microclimate are influenced by perennial and/or intermittent water.

Riparian Conservation Area (RCA) ~ As established by the Forest Plan, RCAs are portions of watersheds where riparian-dependent resources receive primary emphasis and management activities are subject to specific standards and guidelines. Examples include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems. The following categories describe RCAs unless developed and documented through a watershed or site specific analysis:

> **Category 1 –** Fish bearing streams: RCAs consist of the stream and the area on either side of the steam extending from the edge of the active channel to the top of the inner gorge, or to the outer edges of the 100 year floodplain, or to the outer edge of the riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet including both sides of the stream channel), whichever is greatest.
>
> **Category 2 –** Permanently flowing non-fish bearing streams: RCAs consist of the stream and the area on either side of the steam extending from the edge of the active channel to the top of the inner gorge, or to the outer edges of the 100 year floodplain, or to the outer edge of the riparian vegetation, or to a distance equal to the height of one site potential trees, or 150 feet slope distance (300 feet including both sides of the stream channel), whichever is greatest.
>
> **Category 3 –** Ponds, lakes, reservoirs, and wetlands greater than 1 acre: RCAs consist of the body of water or wetland and the area to the outer, edges of the riparian vegetation, or to the extent of the seasonally saturated soil, or to the extent of moderately and highly unstable areas, or to a distance equal to the height of one site-potential trees, or 150 feet

slope distance from the edge of the maximum pool elevation of constructed ponds and reservoirs or from the edge of the wetland, pond, or lake, whichever is greatest.

Category 4 – Seasonally flowing or intermittent streams, wetlands less than 1 acre, landslides, and landslide-prone areas: This category includes features with high variability in size and site-specific characteristics. At a minimum, the RCAs must include:

a. The extent of landsides and landslide-prone areas.
b. The intermittent stream channel and the area to the top of the inner gorge.
c. The intermittent stream channel or wetland and the area to the outer edge of the riparian vegetation.
d. For Fish Conservation Watersheds, the area from the edges of the stream channel, wetland, landslide, or landslide-prone area to a distance equal to the height of one site-potential tree, or 100 feet slope distance, whichever is greatest.
e. For watersheds not identified as Fish Emphasis Key Watersheds, the area from the edges of the stream channel, wetland, landslide, landslide-prone area to a distance equal to the height of one-half site potential tree, or 50 feet slope distance, whichever is greatest.

Riparian Management Objective (RMO) ~ Fish habitat objectives established by Inland Native Fish Strategy for pool frequency, large woody debris, water temperature, and width-to-depth ratio on all streams in the project area.

Risk ~ The chance of loss

Risk Ratio (for cumulative watershed effects model) ~ Amount of the disturbance in the watershed relative to the hydrologic or sediment inference point

Road ~ A motor vehicle travelway over 50” wide, unless classified and managed as a trail. A road may be classified, unclassified, or temporary (36 CFR 212.1).

- **Classified Roads:** Roads wholly or partially within or adjacent to National Forest System lands that are determined to be needed for long-term motor vehicle access, including State roads, county roads, privately owned roads, National Forest System roads, and other roads authorized by the Forest Service (36 CFR 212.1).
- **Temporary Roads:** Roads authorized by contract, permit, lease, other written authorization, or emergency operation, not intended to be a part of the forest transportation system and not necessary for long-term resource management (36 CFR 212.1).
- **Unclassified Roads:** Roads on National Forest System lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travelways, and offroad vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization (36 CFR 212.1). The regulations at 36 CFR 223.37 require revegetation within 10 years.

Road Cut ~ Soil or rock material removed during road construction, usually from the upslope side of the road

Road Decommissioning ~ Activities that result in the stabilization and restoration of unneeded roads to a more natural state

Road Fill ~ Soil or rock material placed on the ground as part of the road surface

Road Maintenance ~ The ongoing upkeep of a road necessary to retain or restore the road to the approved road management objective

Rosgen Channel Classification ~ The Rosgen classification system was developed by Dave Rosgen and assigns a channel type based on channel slope, width to depth ratio, bed material, entrenchment ratio and sinuosity.

Salvage ~ Removal of recently-dead, dying, or deteriorating trees to minimize the loss of wood products

Sanitation ~ The removal of damaged or susceptible trees, essentially to prevent the spread of insects or disease; an improvement cut

Scoping ~ The process used to identify the scope of issues to be addressed and to determine the significant issues related to a proposed action

Sediment ~ Soil particles in water. Suspended sediment consists of small soil particles carried along by the water's turbulent flow

Sensitive Species ~ Those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by a) Significant current or predicted downward trends in population numbers or density or, b) Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution. Forest Service sensitive species are not "listed" under the Endangered Species Act and may not occur on all the forests within a Forest Service Region. Regional sensitive species lists undergo periodic review and are subject to change. G rankings denote global (range wide) and state status from 1 (critically imperiled) to 5 (demonstrably secure).

Species ~ A unit of classification of plants and animals consisting of the largest and most inclusive array of sexually reproducing and cross-fertilizing individuals, which share a common gene pool.

Silviculture ~ The art and science of growing and tending forest vegetation. It includes controlling the establishment, composition, and growth of forests for specific management goals

Silviculture Prescription ~ A site-specific operational plan that describes the forest management objectives for an area. It prescribes the method for harvesting the existing forest stand, and a series of silviculture treatments that will be carried out to establish a free growing stand in a manner that accommodates other resource values as identified

Site Potential Tree Height ~ The average maximum height of the tallest dominant trees (200 years or older) for a given site class

Skyline Yarding System ~ Moving logs from the stump to the landing either partially or fully suspended by a cable

Snag ~ A standing dead tree

Social Analysis ~ Analysis that uses social science information to determine how proposed actions would affect humans

Soil Porosity ~ State of having pores or holes in the soil that hold air or water; permeability

Soil Productivity ~ The capability of a soil to produce a specific crop such as fiber, forage, etc., under defined levels of management

Stand ~ A community of trees or other vegetation uniform in composition, constitution, age, spatial arrangement, or condition to be distinguishable from adjacent communities

Stand Density Index (SDI): A relative measure of the amount of stocking on a forest area. Often described in terms of stems per acre

Standard and Guideline ~ A principle requiring a specific level of attainment, a rule to measure against

Stocking ~ The degree to which trees occupy the land, measured by BA and/or number of trees by size and spacing, compared with a stocking standard; that is, the BA and/or number of trees required to fully utilize the land's growth potential. Where tree growth is inhibited due to competition from too many trees, the site is said to be overstocked

Stocking Control ~ See thinning

Suppression Forces ~ Resources used to fight a fire, consisting of firefighters with hand tools at a minimum; may also include fire engines and bulldozers, helicopters and tanker planes

Suppressed Trees ~ Smaller trees in the lower canopy layer

Surface Fire ~ Fire that remains on the forest floor because the combination of fire intensity and ladder fuels is not sufficient to move it into the tree crowns. Only surface fuels and small vegetation are burned

Surface Fuels ~ Loose combustible material on the soil surface, consisting of fallen leaves, twigs, bark, and small branches, as well as grasses, small plants, seedlings trees, dead branches, and logs

Thinning ~ Removing trees from a stand to redistribute the growth potential or to benefit the quality of the residual stand

Threatened Species ~ A United States Fish and Wildlife Service or NOAA Fisheries designation of a plant or animal species that is threatened throughout all or a specific portion of its range.

Torching ~ Ignition and subsequent flare-up of a fire, usually burning from the bottom to the top of a tree or small group of trees

Tree Crown ~ Leafy portion

Turbidity ~ Deposition of substrate material suspended in water

Understory ~ Vegetation (trees or shrubs) growing under the canopy formed by taller trees.

Variable Density Thinning ~ A thinning treatment that results in an irregularly distributed and unevenly stocked stand. Conditions range from widely spaced (40’–60’) trees (those being cultured for large tree attributes) to no-thin areas with dense thickets of trees. Between these extremes, the remaining stand is thinned with variations according to tree species, crown position, tree attributes, slope position, aspect and elevation

Vertical Fuels ~ Standing vegetation, either live or dead.

Viable Population ~ A population, which has the estimated numbers and distribution of reproductive individuals to insure continued existence well distributed in the planning area. To insure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area.

Water Repellency (for soils) ~ Loss of soil porosity, preventing water from infiltrating and causing water to run off

Watershed ~ An area of land with a characteristic drainage network that contributes surface or ground water to the flow at that point; a drainage basin or a major subdivision of a drainage basin. A watershed address consists of a name and a number (for example, Lower James watershed, 02080206). The 8-digit number is a Hydrologic Unit Code or HUC. The Hydrologic Unit system is a standardized watershed classification system developed by USGS in the mid-1970s. Hydrologic units are watershed boundaries organized in a nested hierarchy by size. They range in size from regions to the smaller cataloging units (HUCs), which are roughly equivalent to your local watershed (example follows).

- **5th field watershed:** A watershed that ranges from about 40,000 to 250,000 acres in size
- **6th field watershed:** A watershed that ranges from about 10,000 to 40,000 acres in size
- **7th field watershed:** A watershed or drainage that ranges from about 2,500 to 10,000 acres in size

Watershed Analysis ~ Watershed analysis is a systematic procedure for characterizing watershed and ecological processes to meet specific management and social objectives

Wet Weather Operations Standards ~ Specific information used to help determine when activities are at risk of not meeting BMPs. The guidelines are used to determine if conditions are favorable for wet weather or winter operations, and to provide guidance as to when conditions warrant suspension of operations, when operations may begin or resume, or when and what remedies may be appropriate

Wetlands ~ Those areas that are inundated by surface or ground water with a frequency sufficient, under normal circumstances, to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands include marshes, bogs, sloughs, potholes, river overflows, mud flats, wet meadows, seeps, and springs.

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United States
Department of
Agriculture

Forest
Service

October 2012

Draft Environmental Impact Statement

Flint Foothills Vegetation Management - Volume 2 Appendices

Pintler Ranger District, Beaverhead-Deerlodge National Forest
Granite and Powell Counties, Montana

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Appendix A – Comparison of Proposed Actions

Changes to the Proposed Action since the 2011 Scoping Letter

Table A- 1. Changes to the proposed action since the 2011 scoping letter

Unit #	2011 Scoping Acres/DEIS Proposed Action Acres	Recommended Change	Reason	Decision
Clearcut Salvage (S)				
9S	2/0	Drop unit.	This unit is a small patch of dead trees that were previously left as wildlife leave patch. Will retain the leave patch and drop the unit.	Drop unit. Decision: 08/19/2011
10S	31 /31	Change treatment prescription to commercial thin (10C).	Unit has a Douglas-fir component (unit number remains the same; the alpha code changes to “C”).	Change treatment prescription from salvage by clearcut to commercial thin. Decision 08/19/2011
26S	25/25	Change logging system to all cable	Insufficient volume for tractor logging.	Change to all cable logging. Decision 08/19/2011
36S and 47S	36S: 46 /61 47S: 13/13	Temp road needs to be a specified road. Due to high cost of construction, it’s recommended that the proposal add the road to the transportation system as a maintenance level I road, rather than propose as a temp road, followed by decommissioning. Consider adding on to the unit to log additional areas (14 acres) with cable logging systems.	Due to steep slopes, road needs to be built to specifications. With the specified road, additionally there are opportunities to include salvage harvest of adjacent areas with cable logging systems.	Will propose a spec road, adding it to the transportation system at a maintenance level 1. Added adjacent areas (salvage) that could be logged with cable systems from the spec road. Decision: 08/19/2011
42S	31 /31	Change to commercial thin (42C).	Unit has a Douglas-fir component (unit number remains the same; the alpha code changes to “C”).	Change treatment prescription from salvage by clearcut to commercial thin. Decision 11/04/2011
43S	43S: 20/11	Split unit so area south of section line is	Unit has a Douglas-fir component.	Split unit into two treatments;

Unit #	2011 Scoping Acres/DEIS Proposed Action Acres	Recommended Change	Reason	Decision
	81C: 0/9	changed to commercial thin (81C).	Southern portion of unit should be commercial thin (unit number remains the same; the alpha code changes to "C" for the commercial thin area).	part salvage and part commercial thin. Decision 08/19/2011
44S	20/31	Expand unit boundary to include all operable acres (to RCA).	Additional lodgepole pine salvage opportunity.	Expand unit. Decision 08/19/2011
67S	33/33	Change to commercial thin (67C).	Upper portion Douglas fir with lodgepole pine. Only small portion salvage only (unit number stays the same; alpha code changes to "C").	Change treatment prescription, from salvage to commercial thin. Decision: 11/04/2011
68S	38/38	Change treatment prescription to commercial thin (68C).	Douglas fir unit with lodgepole pine salvage (unit number stays the same; alpha code changes to "C").	Change treatment prescription, from salvage to commercial thin. Decision: 11/04/2011
71S	122/122	Change treatment prescription to commercial thin (71C).	Mainly a Douglas-fir unit that will be thinned with some salvage component (unit number stays the same; alpha code changes to "C").	Change treatment prescription, from salvage to commercial thin. Decision: 11/04/2011
73S	0/64	Add new salvage unit (near 52C).	Overlooked opportunity.	Add unit. Decision 08/19/2011
74S	0/74	Add new salvage unit (adjacent to 36S). All of this unit would be cable logged	Overlooked opportunity.	Add unit. Decision 08/19/2011
Commercial Thin (C)				
1C	101/102*	Change treatment prescription to seed tree/w	To plant ponderosa pine. This will favor	Change treatment prescription

Unit #	2011 Scoping Acres/DEIS Proposed Action Acres	Recommended Change	Reason	Decision
		reserves (1ST).	ponderosa pine in the lower elevations (unit number remains the same; the alpha code changes to “ST”).	from commercial thin to seed tree with reserves. Decision: 11/04/2011
5C	47/47	Change treatment prescription to seed tree/w reserves (5ST).	To plant ponderosa pine. This will favor ponderosa pine in the lower elevations (unit number remains the same; the alpha code changes to “ST”).	Change treatment prescription from commercial thin to seed tree with reserves. Decision: 11/04/2011
6C	13/0	Drop unit.	Heritage site concerns: Heritage Specialist recommends dropping the unit.	Drop Unit: Decision: 09/23/2011
13C	3/0	Drop unit.	The unit was previously a reserve patch and does not have a commercial component.	Drop unit: Decision 08/19/2011
27C	139/139	Change treatment prescription to seed tree/w reserves (27ST).	To favor ponderosa pine and to plant ponderosa if needed. A lot of advanced regeneration in portions. This will have pre-commercial thinning embedded in it for the advanced pockets of regeneration. This will favor ponderosa in the lower elevations (unit number remains the same; the alpha code changes to “ST”).	Change treatment prescription from commercial thin to seed tree with reserves. Decision: 11/04/2011
30C	39/39	Change treatment prescription to seed tree/w reserves (30ST).	Unit was logged before and advanced regeneration in cable corridors is being affected by budworm. Relieve pressure off of advanced regeneration from budworm (unit number remains the same; the alpha code changes to “ST”).	Change treatment prescription from commercial thin to seed tree with reserves. Decision: 11/04/2011
32C	18/18	Change treatment prescription to seed tree/w reserves (32ST).	This will favor ponderosa pine. Unit was logged before and advanced regeneration in cable corridors is being	Change treatment prescription from commercial thin to seed tree with reserves.

Unit #	2011 Scoping Acres/DEIS Proposed Action Acres	Recommended Change	Reason	Decision
			affected by budworm. Want to interplant ponderosa pine here (unit number remains the same; the alpha code changes to “ST”).	Decision: 11042011
34C	78/78	Change treatment prescription to salvage (34S)	Wasn’t enough Douglas-fir for a commercial thin; more dead lodgepole pine, so changed to a salvage by clearcut unit.	Change treatment prescription from commercial thin to clearcut salvage. Decision: 11/04/2011
55C	173/175*	No change in prescription or unit boundary; changes due to rounding in GIS	N/A	N/A
63C	73/0	Drop unit.	Unit is not conducive to any treatment prescriptions developed for this project.	Drop unit. Decision:08/19/2011
65C	8/8	Change treatment prescription to seed tree/w reserves (65ST).	Change to seed tree to favor ponderosa pine in the lower elevations (unit number remains the same; the alpha code changes to “ST”).	Change treatment prescription from commercial thin to seed tree with reserves. Decision: 11/04/2011
Commercial Thin/Clearcut Salvage (CS)				
6CS	13/14	Change treatment prescription, from 6CS to commercial thin (6C).	Had enough Douglas-fir for commercial thin (unit number remains the same; the alpha code changes to “C”).	Change treatment prescription from commercial thin/salvage to commercial thin. Decision: 11/04/2011
7CS	77/0	Drop unit.	From Heritage specialist: There is a large heritage site at the northern end of the unit. Surveys on the southern 1/4 of the unit located mining activity and a cabin. I anticipate finding more historic mining activity as I move northward. I	Drop unit. Decision 08/19/2011

Unit #	2011 Scoping Acres/DEIS Proposed Action Acres	Recommended Change	Reason	Decision
			recommend we drop the unit.	
8CS	13/13	Change treatment prescription to commercial thin (8C)	Had enough Douglas-fir for commercial thin (unit number remains the same; the alpha code changes to “C”).	Change treatment prescription from commercial thin/salvage to commercial thin. Decision: 11/04/2011
11CS	13/17	Change treatment prescription to commercial thin (11C) and increase unit size.	Had enough Douglas-fir for commercial thin. Include adjacent opportunities (unit number remains the same; the alpha code changes to “C”).	Change treatment prescription from commercial thin/salvage to commercial thin and increase unit acreage. Decision: 08/19/2011.
18CS	5/0	Drop or add onto.	This unit will be less than 5 acres once the Roadside 4 component is taken out. It also has mining sites adjacent to it, and contains old growth. Heritage specialist recommends dropping unit, 09/15/2011.	Drop Unit. Decision:09/23/2011
22CS	16/16	Change treatment prescription to commercial thin (22C).	Had enough Douglas-fir for commercial thin (unit number remains the same; the alpha code changes to “C”).	Change treatment prescription from commercial thin/salvage to commercial thin. Decision: 11/04/2011
28CS	13/13	Change treatment prescription to commercial thin (28C).	Had enough Douglas-fir for commercial thin (unit number remains the same; the alpha code changes to “C”).	Change treatment prescription from commercial thin/salvage to commercial thin. Decision: 11/04/2011
46CS	79/79	Change treatment prescription to salvage (46S).	More lodgepole pine than Douglas-fir. This unit may look like a seed tree with reserves prescription where there is plentiful Douglas-fir (unit number	Change treatment prescription from commercial thin/salvage to salvage by clearcut.

Unit #	2011 Scoping Acres/DEIS Proposed Action Acres	Recommended Change	Reason	Decision
			remains the same; the alpha code changes to “S”).	Decision: 11/04/2011
48CS	48 CS:196 48C: 157 77S: 16 78S: 23	Separate out commercial thin and salvage components. Change to 48C, and add 77S and 78S.	This is a large unit containing lodgepole pine stands that need to be salvaged (unit number for commercial thin remains the same, the alpha code changes to “C”; two new “S” units added).	Change treatment prescription, from commercial thin/salvage to individual commercial thin and salvage by clearcut units. Decision: 11/04/2011
52CS	52CS:136 52S: 94 65C: 18 66C: 24 79S: 31	Separate out commercial thin and salvage components. Expand unit to include area to the northwest on the downhill side of the road. Unit split into four units: 52S, 65C, 66C and 79S.	Standard mitigation is 100 feet for any mining site. Will need heritage survey findings to make final determination on road location. The temporary road location was changed away from the ditch; the Heritage specialist will determine where appropriate to cross the ditches and pursue the approval to do so. Cabin foundation was noted.	Change temp road location. Change treatment prescription, from commercial thin/salvage to individual commercial thin and salvage by clearcut units. Decision: 08/19/2011 11/04/2011
56CS	18/18	Change treatment prescription, from 56CS to commercial thin (56C).	Had enough Douglas-fir for commercial thin (unit number remains the same; the alpha code changes to “C”).	Change treatment prescription from commercial thin/salvage to commercial thin. Decision: 11/04/2011
57CS	27/27	Change treatment prescription, from 57CS to commercial thin (57C).	Had enough Douglas-fir for commercial thin (unit number remains the same; the alpha code changes to “C”).	Change treatment prescription from commercial thin/salvage to commercial thin. Decision: 11/04/2011
58CS	49 acres	Change treatment prescription to salvage by clearcut (58S).	More lodgepole than Douglas-fir (unit number remains the same; the alpha code changes to “S”).	Change treatment prescription from commercial thin/salvage to salvage by clearcut.

Unit #	2011 Scoping Acres/DEIS Proposed Action Acres	Recommended Change	Reason	Decision
				Decision: 08/19/2011
60CS	14/14	Change treatment prescription from commercial thin/salvage to commercial thin (60C).	Had enough Douglas-fir for commercial thin (unit number remains the same; the alpha code changes to “C”).	Change treatment prescription from commercial thin/salvage to commercial thin. Decision: 11/04/2011
Temp road to 80C	N/A	Add 0.2 mi temporary road access to 80CS	Added to reduce adverse skidding in the unit.	Add temp road for 80CS. Decision: 09/23/2011
Precommercial Thin				
9P	31	Change treatment prescription to commercial thin (80C).	Has commercial timber; was not appropriate for precommercial thinning. New number used for the unit.	Change to commercial thin unit. Decision: 09/23/2011
10P	32	Change to salvage (76S).	This was originally identified incorrectly as a precommercial thin. This unit has commercial-sized trees that are ready to be salvaged. New number used for the unit.	Change to salvage by clearcut unit. Decision: 09/23/2011.
1P, 4P, 5P, 7P, 8P, 13P, 15P, 16P, 18P, 19P, 20P, 22P 29P, 30P	662	Dropped from precommercial thinning. Evaluate potential for commercial component.	Some or all of these units are beyond the need for precommercial thinning, and some may have a commercial component.	Dropped units that were not viable for precommercial thinning. Decision: 09232011
26P	122	Combined PCT units 2P, 3P, 6P, 26P and 21P	Decided units could be combined, 09/15/2011.	Combine 5 precommercial units into one unit. Decision: 09/23/2011
3P, 8P,	647	Added “new” precommercial units. Some of		Add units that were intended

Unit #	2011 Scoping Acres/DEIS Proposed Action Acres	Recommended Change	Reason	Decision
9P, 10P, 14P, 16P, 17P, 20P, 21P, 25P, 27P, 28P, 29P, 30P, 31P, 32P, 41P, 42P, 43P, 45P		these unit numbers are the same as what was used in the proposed action, but the units are different.		to be part of the proposed action Decision: 09/23/2011

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Appendix B – Scoping Comments and the Forest Service Responses; Literature Review

Scoping Comments and the Forest Service Responses

Table B-1 lists 15 comment letters by date received from scoping for the Flint Foothills Project. Letters 1-7 were received in response to scoping for the planned Flint Foothills Environmental Assessment. After it was determined that an Environmental Impact Statement was needed, a second round of scoping letters were mailed. The letters received in response to that second round of scoping begins with number 8 and continues to number 15.

Table B-2 is the summary of all the scoping comments derived from the letters.

Table B- 1. Scoping contacts Flint Foothills Project

Letter #	Date Received	Name
1	7.06.2010	Michael Garrity - Alliance for Western Rockies/Sara Johnson, Native Ecosystems Council
2	7.17.2010	Steve Flynn - Sun Mountain Lumber
3	7.06.2010	Sarah Jane Johnson - Native Ecosystem Council/Michael Garrity - Alliance for the Wild Rockies
4	7.29.2010	Dick Artley
5	7.27.2010	Cliff Nelson, Maureen Connor, Suzanne Browning – Granite County Board of Commissioners
6	8.03.2010	Mack Long - Fish, Wildlife and Parks
7	8.17.2010	Darren Dunham, Royal Outfitters
8	6.02.2011	Usacitizen1
9	6.08.2011	Stan Wilmoth, PhD. Montana State Archeologist/Deputy, SHPO. Montana Historical Society
10	6.09.2011	Dick Artley
11	6.22.2011	Julie A. DalSoglio, Acting Director Montana Office of the United States Environmental Protection Agency.
12	7.05.2011	Michael Garrity - Alliance for Western Rockies/Sara Johnson, Native Ecosystems Council
13	7.06.2011	Sarah Jane Johnson - Native Ecosystem Council/Michael Garrity - Alliance for the Wild Rockies
14	7.11.2011	Carolyn Boyer-Smith – The Shoshone-Bannock Tribe
15	7.21.2011	Robert Ray – Montana Department of Environmental Quality

The following table summarizes the public comments received during scoping and describes how each comment was addressed during the analysis process. The full content of letters and emails are available in the processes section of the project record. Please refer to table B- 1 above to cross-reference the letter number with the person making the comment.

Table B- 2. Scoping comments and the Forest Service Responses for the Flint Foothills Project

Comment/Concern	Letter Number	Response to Comment How Comment was Addressed
General/Support/Nonsupport		
General Comments		
Thank you for the opportunity to comment. Please accept these comments on the Flint Foothills Vegetation Management Project proposal, in response to the scoping notice I received on July 6, 2010 on behalf of the Alliance for the Wild Rockies and Native Ecosystems Council.	1	You are welcome. Thank you for your comment
Please keep us on your list to receive further mailings on the proposal.	1 and 12	Thank you for your interest in the project. You will remain on the mailing list for future notifications.
…please keep me informed on this project	2	Thank you for your interest in the project. You will remain on the mailing list for future notifications.
(AWR) would like to be included in the public involvement process for the planned Flint Foothills Vegetation Management Project. Both NEC and AWR would like to receive hard copies of the NEPA document when it is released for public comment.	3	Hard copies of the NEPA document will be sent to AWR and NEC.
I have read your scoping letter for the Foothills Vegetation Management project. Please consider the following comments and insert a hardcopy in the project file. After receiving the hardcopy scoping package I went to the electronic home page for the Beaverhead Deerlodge NF looking for the electronic copy of the scoping package. It had not been posted. There are members of the public by the thousands nationwide that are interested in commenting on proposed timber sales proposed on their land. Sending a few hundred hardcopy scoping letters excludes these national forest owners. Please post the information by August 1	4	Your comment letter is part of the project file. We're sorry for any inconvenience with respect to locating the 2010 scoping information on the Forest's website. The project was listed on the Schedule of Proposed Activities for the 07/01/2011-09/30/2011 quarterly publication. The link to the Beaverhead-Deerlodge NF Project's page, which included project documents, was provided in the 10/01/2011-12/31/2011 SOPA publication, or could be directly

Comment/Concern	Letter Number	Response to Comment How Comment was Addressed
		accessed through the Forest's website.
When I access the "Resource Management" section, I come to a page that states: "Currently, Timber Management is the only item in this section. We hope to present more information in the future." Timber is not a resource. Timber is a possible use for the conifer trees growing on your forest. There is a multitude of natural resources that exist in the Beaverhead Deerlodge NF. Supervisor Myers, please send me an email with your response to the following question. Why do you choose to highlight "Timber Management" first? Why isn't the date when the information for other resource management projects not shown? When will the date be shown?	4	The Forest's website is updated over time. Currently there are landscape-level assessments and site-specific projects provided under the Resource Management section of the Land and Resource Management Section of the BDNF webpage.
I collectively own the Beaverhead-Deerlodge National Forest. I am joined by 306 million Americans. The CEO and stockholders own the forest too, but any corporate use motivated by profit at the expense of the proper functioning of the natural resources should be disallowed by the Responsible Official. Timber harvest and associated access road construction might be warranted to solve a vegetation problem 3% to 5% of the time on public land. Instead, the Forest Service proposes commercial timber harvest to solve vegetation problems. Most of these so-called vegetation problems are dreamed up by humans to satisfy human needs at the expense of the proper functioning of the natural resources in the forest.	4	Thank you for your comment
Please include me in the mailing list to receive continued updates on the project.	7	Thank you for your interest in the project. You will remain on the mailing list for future notifications.
Thank you for seeing that we received a copy of the revised Flint Foothills Vegetation Treatment proposal.	9	You are welcome. Thank you for your comment.
I thank you for giving me the opportunity to submit scoping comments for the proposed Flint Foothills Vegetation Management project.	10	You are welcome. Thank you for your comment.
We are losing about 200 square miles of our public land to development each week.	10	Thank you for your comment.
Thank you for your attention and time. I look forward to reading the draft NEPA document that responds to my concerns.	10	You are welcome. Thank you for your comment.
Thank you for the opportunity to comment. Please accept these comments on the Flint Foothills Vegetation Management Project proposal on behalf of the Alliance for the Wild Rockies and Native Ecosystems Council. We incorporate our previous scoping comments.	12	You are welcome. Thank you for your comment
Both NEC and A WR would specifically like to request a "hard copy" of the draft environmental impact statement when it is released for public comment.	13	Hard copy of the Draft Environmental Impact Statement will be provided when it is released for public comment.

Comment/Concern	Letter Number	Response to Comment How Comment was Addressed
The Shoshone-Bannock Tribes (Tribes) Heritage Tribal Office (He TO) appreciate, the opportunity to comment on the proposed Flint foothills Project.	14	You are welcome. Thank you for your comment.
Support		
Thank you for the opportunity to provide comment and express our strong support for the Flint Foothills Vegetation Management Project. We are encouraged that the Forest Service is pursuing active resource management and addressing current forest management opportunities The proposed action detailed in the scoping document dated July 2, 20I0 provides an excellent plan to meet environmental, economic and cultural objectives for the citizens of Granite County, Montana, and the United States as a whole.	5	Thank you for your support.
Management actions described in the document are additionally supportive of the identified management priority for the Flint Foothills and Flint Uplands Management Areas as identified in the Beaverhead-Deerlodge Forest Plan (2009). Timber production, livestock grazing and dispersed recreation will all benefit from responsible forest management. However, dynamic and healthy forest resources are beneficial to all resource uses and are not confined to just those listed as priorities for the management area.	5	Thank you for your support.
Again, thank you for this opportunity to express our strong support for the proposed action for the Flint Foothills Vegetation Management Project. It is an environmentally, economically, and culturally responsible plan that addresses forest resource management in an active fashion. We would like to offer our support in any manner that may expedite implementation of the proposed action including acting as an intervener on your behalf if that becomes necessary.	5	Thank you for your support.
We have reviewed the scoping notice for this proposal for vegetation management activities on approximately 5,591 acres within the 44,493-acre project area, located mainly in the Flint Foothills Management Area (MA) with some in the northern Flint Uplands MA. Proposed project actions include harvesting dead/dying lodgepole pine, commercially thinning ponderosa pine and Douglas fir, prescribed burning, and precommercial thinning. We have no specific comments at this time, but we offer the following. As usual, we value your help in getting the message out to timber contractors on the need to contain bear and other wildlife attractants. And that bears are attracted to oil products including machinery lubricants, and can therefore be expected to investigate logging sites. We also note reports in recent years of occasional grizzly bears in the Flints. Please feel free to contact our bear specialist, Jamie Jonkel (phone 406-542-5508; jajonkel@mt.gov) regarding updated grizzly locations for this area. For any fisheries related consultation, please feel free to contact our area fisheries biologists: For Granite County portions of this proposal, Brad Liermann (406-825-5225 at Rock Creek, bliermann@mt.gov), and for Powell County, Jason Lindstrom (406-846-8058 at Deer Lodge, jlindstrom@mt.gov). For general wildlife consultation, please contact area wildlife biologist Ray Vinkey (406-859-1704 at Philipsburg; rvinkey@mt.gov). Thank you for providing the opportunity for Region 2 FWP to comment on this proposal.	6	Project design features (chapter 2, p. 43) directed at containment of wildlife attractants at project work sites are incorporated into the project,

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I think the impact on our outfitting operation will be minimal, it may impact some of our hunting in the Gird Ck drainage but we have plenty of country to hunt and I have no problem making adjustments since we have a large area to hunt.	7	Thank you for your comment. The recreation section of the DEIS, p. 355. discloses impacts to outfitter operations in the recreation section. Anticipated effects are a result of timing restrictions, delays, and temporary road or area closures for public safety while treatment activity is occurring. Such effects are site specific and the majority of the general forest area is expected to remain accessible for recreation use as treatments occur over time.
The Watershed Protection Section (WPS) of the Montana Department of Environmental Quality appreciates the opportunity to provide scoping comments on the proposed Flint Foothills Vegetation Management project. The WPS supports the overall purpose and need for the proposed project.	15	Thank you for your support.
Nonsupport		
These are national public lands belonging to every citizen in the usa. they don't belong to the fs. you are a temporary agency. The fs has turned into a truly destructive force. Your actions result in human hospitalization and death. your actions are a disaster for america, not a help The plan needs revision	8	Thank you for your comments. The proposed action has been revised since the scoping letter was published.
EIS Process/Monitoring/Opposing Science/Costs		
EIS Process		
The Forest Service must complete a full environmental impact statement (EIS) for this Project because the scope of the Project will likely have a significant individual and cumulative impact on the environment. Following the list of necessary elements, Alliance has also included a general narrative discussion on possible impacts of the Project, with accompanying citations to the relevant scientific literature. These references should be disclosed and discussed in the EIS for the Project. The Alliance for the Wild Rockies and Native Ecosystems Council (collectively "Alliance") submit the following comments to guide the development of the environmental analysis for the proposal. The Forest Service must complete a full environmental impact statement (EIS) for this Project because the scope of the Project will likely have a significant individual and cumulative impact on the environment. Alliance has	1 and 12	**A**. Standards are addressed through project design features, chapter 2, p. 43 The Forest Plan Consistency Checklist addresses how each standard is met, appendix C. **B.** All reasonably foreseeable future actions are described in table 24. An associated map is

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reviewed the statutory and regulatory requirements governing National Forest Management projects, as well as the relevant case law, and compiled a check-list of issues that must be included in the EIS for the Project in order for the Forest Service's analysis to comply with the law. Following the list of necessary elements, Alliance has also included a general narrative discussion on possible impacts of the Project, with accompanying citations to the relevant scientific literature. These references should be disclosed and discussed in the EIS for the Project. I. Necessary elements for project EIS: A.Disclose all Beaverhead-Deerlodge National Forest Plan requirements for logging/burning projects and explain how the Project complies with them; B.Disclose the acreages of past, current, and reasonably foreseeable logging, grazing, and road-building activities within the Project area; C.Solicit and disclose comments from the Montana Department of Fish, Wildlife, and Parks and the U.S. Fish and Wildlife Service regarding the impact of the Project on fish and wildlife habitat; D.Solicit and disclose comments from the Montana Department of Environmental Quality regarding the impact of the Project on water quality; E.Disclose the biological assessment for the candidate, threatened, or endangered species with potential and/or actual habitat in the Project area; F.Disclose the biological evaluation for the sensitive and management indicator species with potential and/or actual habitat in the Project area; G.Disclose the snag densities in the Project area, and the method used to determine those densities; H.Disclose the current, during-project, and post-project road densities in the Project area; I.Disclose the Beaverhead-Deerlodge National Forest's record of compliance with state best management practices regarding stream sedimentation from ground-disturbing management activities; J.Disclose the Beaverhead-Deerlodge National Forest's record of compliance with its monitoring requirements as set forth in its Forest Plan; K. Disclose the Beaverhead-Deerlodge National Forest's record of compliance with the additional monitoring requirements set forth in previous DN/FONSIs and RODs on the Beaverhead-Deerlodge National Forest; L. Disclose the results of the field surveys for threatened, endangered, sensitive, and rare plants in each of the proposed units; M. Disclose the level of current noxious weed infestations in the Project area and the cause of those infestations; N. Disclose the impact of the Project on noxious weed infestations and native plant communities; O. Disclose the amount of detrimental soil disturbance that currently exists in each proposed unit from previous logging and grazing activities; P. Disclose the expected amount of detrimental soil disturbance in each unit after ground disturbance and		provided in appendix D. The past and current acreages of vegetation projects are provided in appendix D. The grazing allotments, including acreages, are discussed in the Range section of the DEIS, p. 343. A GIS query indicates that 204 miles of road have been built within the project area, including roads that are now closed. **C**. MFWP provided comments in response to the Forest scoping effort. Consultation with the USFWS will be conducted concerning project impacts to grizzly bears and westslope cutthroat trout. **D**. Montana Department of Environmental Quality provided comments (letter 15) to the 2011 scoping letter. **E.** No threatened or endangered plants are known to occur on the Beaverhead-Deerlodge National Forest. None were found during project surveys. DEIS, p.113. No threatened or endangered aquatic species are known to occur in the project area, DEIS, p. 310. A biological assessment is being conducted to assess project impacts to grizzly bears **F**. The sensitive plant biological evaluation is incorporated into the DEIS, p.113 and includes the

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prior to any proposed mitigation/remediation; Q. Disclose the expected amount of detrimental soil disturbance in each unit after proposed mitigation/remediation; R. Disclose the analytical data that supports proposed soil mitigation/remediation measures; S. Disclose the timeline for implementation; T. Disclose the funding source for non-commercial activities proposed; U. Disclose the current level of old growth forest in each third order drainage in the Project area; V. Disclose the method used to quantify old growth forest acreages and its rate of error based upon field review of its predictions; W. Disclose the historic levels of mature and old growth forest in the Project area; X. Disclose the level of mature and old growth forest necessary to sustain viable populations of dependent wildlife species in the area; Y. Disclose the amount of mature and old growth forest that will remain after implementation; Z. Disclose the amount of current habitat for old growth and mature forest dependent species in the Project area; AA. Disclose the amount of habitat for old growth and mature forest dependent species that will remain after Project implementation; BB. Disclose the method used to model old growth and mature forest dependent wildlife habitat acreages and its rate of error based upon field review of its predictions; CC. Disclose the amount of big game (moose and elk) hiding cover, winter range, and security currently available in the area; DD. Disclose the amount of big game (moose and elk) hiding cover, winter range, and security during Project implementation; EE. Disclose the amount of big game (moose and elk) hiding cover, winter range, and security after implementation; FF. Disclose the method used to determine big game hiding cover, winter range, and security, and its rate of error as determined by field review; GG. Disclose and address the concerns expressed by the ID Team in the draft Five-Year Review of the Forest Plan regarding the failure to monitor population trends of MIS, the inadequacy of the Forest Plan old growth standard, and the failure to compile data to establish a reliable inventory of sensitive species on the Forest; HH. Disclose the actions being taken to reduce fuels on private lands adjacent to the Project area and how those activities/or lack thereof will impact the efficacy of the activities proposed for this Project; II. Disclose the efficacy of the proposed activities at reducing wildfire risk and severity in the Project area in the future, including a two-year, five-year, ten-year, and 20-year projection;		assessment of whitebark pine (candidate species). A biological evaluation and wildlife specialist report has been completed; effects to sensitive and management indicator species is provided in the Wildlife section of the DEIS, pp. 170 and 208. **G**. Project-wide snag densities will not be displayed. FP standards 3 and 4 require snag retention numbers within the proposed harvest units; the FP standard requirements are disclosed and met with the project proposal alternatives. Additionally, with 100% of the lodgepole pine stands affected by mountain pine beetle and pine mortality extensive and continuing, the project-wide snag densities are extensive and increasing. **H**. Road densities are disclosed in the transportation specialist report. They are as follows. Alt 1: before = 2.94 miles per square mile, during = 2.94, after = 2.94. Alt 2: before = 2.94, during = 3.06, after = 2.89. Alt 3: before = 2.94, during = 2.94, after = 2.90. **I, J and K.** Past project and monitoring information is on file at the Beaverhead-Deerlodge National Forest. **L**. The results of the TES plant surveys are provided in the

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JJ. Disclose when and how the Beaverhead-Deerlodge National Forest made the decision to suppress natural wildfire in the Project area and replace natural fire with logging and prescribed burning; KK. Disclose the cumulative impacts on the Forest-wide level of the Beaverhead-Deerlodge National Forest's policy decision to replace natural fire with logging and prescribed burning; LL. Disclose how Project complies with the Roadless Rule; MM. Disclose the impact of climate change on the efficacy of the proposed treatments; NN. Disclose the impact of the proposed project on the carbon storage potential of the area; OO. Disclose the baseline condition, and expected sedimentation during and after activities, for all streams in the area; PP. Disclose maps of the area that show the following elements: 1. Past, current, and reasonably foreseeable logging units in the Project area; 2. Past, current, and reasonably foreseeable grazing allotments in the Project area; 3. Density of human residences within 1.5 miles from the Project unit boundaries; 4. Hiding cover in the Project area according to the Forest Plan definition; 5. Old growth forest in the Project area; 6. Big game security areas; 7. Moose winter range;		Sensitive Plants section of the DEIS, p.113. **M**. The results of the invasive plant surveys and a discussion of the primary cause of presence and dispersal are found in the Invasive Plant section of the DEIS, p.131. **N**. The effects from invasive plant species, and the impacts to sensitive plant populations from project implementation are discussed in the Invasive Plant and Sensitive Plant sections of the DEIS respectively, pp. 139 and 123. **O**. The amount of existing detrimental soil disturbance is provided in the Soils section of the DEIS, starting on p. 239. **P and Q.** The amount of expected soil disturbance in each unit after logging prior to and after mitigation implementation is displayed in the Soils section of the DEIS, p.245. **R**. The analytical data is displayed in the Soils section of the DEIS, starting on p.245. **S**. A timber sale contract is typically 5 years. The prescribed burning is expected to be accomplished over a course of 10 years. **T**. Appropriated funds would be the primary source of funding for proposed non-commercial

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		funding, with the potential of partial funding from RAC funds. **U**. The Forest Plan requires all old growth to be retained; therefore quantifying existing old growth is not required and will not be done. Old growth determination through surveys was done to ensure that existing old growth within proposed units was quantified. These surveys quantified which stands had old growth criteria (Green et al. 2007) at levels that meet old growth definitions so that prescriptions could be designed to retain those stands as old growth after the proposed treatments. **V**. Old growth in proposed treatment units was determined by intensive stand exams following Regional standards. All exams fell within the 95% Confidence Interval. **W**. Historic levels of mature and old-growth forest in the project area are unknown. **X**. Species viability analysis was completed as part of the Forest Plan Revision analysis. The Flint Foothills analysis provides effects analyses and trend determinations for species at spatial scales consisting of the project area and cumulative effects analysis area. **Y**. All of the existing old growth forest would remain after

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		implementation. The only old growth quantified within the project area is within the proposed treatment units, and this old growth would remain after treatment. **Z, AA**. The effects analysis for wildlife discloses the amount of current and post-treatment old growth and mature forest habitat for old growth-associated species addressed in the Wildlife section in the, DEIS starting on p. 181. **BB**. Habitat parameters associated with old-growth and mature habitat analysis are provided in the Wildlife section of the DEIS, starting on page 147. **CC, DD, EE, FF**. The amount of and parameters associated with elk winter range and security areas are disclosed in the Wildlife analysis for the time periods before, during, and after project implementation, in the DEIS beginning on p 208. Moose is not Sensitive or MIS, and is not addressed on the BDNF. **GG**. The Beaverhead-Deerlodge NF Forest Plan was completed in 2009. The first five-year review will be completed in 2014. The Forest Plan Monitoring and Evaluation Strategy directs us to monitor trend for all G1 through G3 sensitive plant species. This monitoring has begun and is continuing to be established for all

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		15 species that meet those criteria. Similarly, monitoring trends of elk and mayfly populations has also begun. **HH and II**. The Forest Service is unaware of any identified hazardous fuels on private lands outside the project area. The purpose and need for the Flint Foothills DEIS (p.4) does not include the need to reduce wildfire risk or severity so these parameters were not assessed. All fuels created by the proposals would be treated and would not be affected by other projects outside of the project area boundary. **JJ and KK**. The Beaverhead-Deerlodge Forest has not made the decision to replace natural fire with logging or prescribed fire although prescribed fire can be used as a tool to meet resource objectives. **LL**. This project complies with the Roadless Area Conservation Rule because it does not propose to build roads or cut timber in any Inventoried Roadless Area. As such, it complies with all Roadless Area Conservation Rule provisions. **MM: I**n general, management actions such as those proposed in the project could improve the resilience of forests to climate-induced increases in frequency

Comment/Concern	Letter Number	Response to Comment How Comment was Addressed
		and intensity of disturbances such as fire and insect and disease epidemics. Global climate change will alter disturbance regimes because many disturbances have a significant climate forcing (e.g. fire, insects) (Turner 2010). As an example, future climate projections now suggest that fire regimes may change even more dramatically than many scientists had previously imagined (Littell et al. 2009). Within the Beaverhead-Deerlodge National Forest, maintaining a diversity of tree species or dominance types, age or size class diversity within dominance types, and forest density similar to what historic disturbance regimes produced, are considered underpinnings of a resilient forest (USDA 2009a). The impact of climate change on the efficacy of the proposed treatments is not entirely known; however, the proposed treatments are designed to create resiliency within the acres treated such that responses of those acres to future disturbance should allow project area to retain function, structure, identity and feedbacks. **NN**. The effects of the project on carbon storage are addressed in the Vegetation section of the DEIS, p. 98. **OO**. The baseline conditions and expected sedimentation during

Comment/Concern	Letter Number	Response to Comment How Comment was Addressed
		and after project implementation are discussed in the Hydrology section of the DEIS, starting on page 279. **PP**. Maps 1 and 2: Figure D-1 and D-2 and D-3 are displayed In appendix D. Map 3. This map was not produced. This information is not relevant to any analyses conducted for the Flint Foothills project. Maps 4, 6 and 7. Hiding cover and thermal cover were not analyzed; wildlife secure areas were addressed per Forest Plan direction (figure 26). Appendix F in the DEIS, provides more rationale for the use of wildlife secure areas (Rohrbacher 2011). Moose are not sensitive species or MIS and are not addressed specifically on the BDNF. Map 5: Not provided; see “U” above. Old-growth in the proposed units is displayed in the DEIS, table 28.
Purpose and Need		
“The statement shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action.” Note that this does not say purposes and needs. The Purpose and Need must disclose the primary (a.k.a. underlying) reason for proposing the project.	4	The purpose and need statements have been revised, and are identified in the DEIS, p 4.

Comment/Concern	Letter Number	Response to Comment How Comment was Addressed
The scoping letter lists 4 reasons for the Foothills Vegetation Management project. If this carries forward into the final NEPA document, you will violate 40 CFR 1502.13 by not identifying the "underlying purpose and need" for the project. If the NEPA document shows multiple purposes and needs, one of them is the REAL reason for the project and the others are anticipated benefits (actual or perceived) that will result when the project is implemented. These effects of implementing the project should be discussed in Chapter 3 of the NEPA document. The Purpose & Need for the Foothills Vegetation Management Project does not Identify the Underlying Purpose and Need. The Purpose and Need is one of the most important sections in ANY NEPA document. There are 2 problems with the Purpose and Need for the Foothills Vegetation Management. First, the P&N headings do not describe the purpose of the treatment. Instead, the P&N headings list the proposed actions. A P&N must have a verb and describe the objective(s) of the proposed treatment. For example: "scarify compacted soil", "remove leaning trees along well traveled roads", Gravel the road" etc. Second, the primary reason for the project is not identified. The CEQ regulations for implementing NEPA at section 1502.13 state:	4	40 CFR 1502. 13 states: "The statement shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action." The regulations do not limit the number of "statements" that comprise the underlying description of the purpose and need for action. The effects of implementing the proposals are described throughout chapter 3 of the DEIS.
40 CFR 1502.13 states: "This section is the heart of the environmental impact statement. Based on the information and analysis presented in the sections on the Affected Environment (Sec. 1502.15) and the Environmental Consequences (Sec. 1502.16), it should present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decision-maker and the public." 40 CFR 1502.16 states: "This section forms the scientific and analytic basis for the comparisons under Sec. 1502.14. It shall consolidate the discussions of those elements required by sections 102(2)(C)(i), (ii), (iv), and (v) of NEPA which are within the scope of the statement and as much of section 102(2)(C)(iii) as is necessary to support the comparisons. The discussion will include the environmental impacts of the alternatives including the proposed action, any adverse environmental effects which cannot be avoided should the proposal be implemented, the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented."	4	40 CFR 1502.13 addresses the purpose and need (DEIS, p.4); CFR1502.14 addresses the alternatives including the proposed action (DEIS, p. 13). Chapter 2 of the DEIS, pp. 13, 19, and 32 describes the no action, the proposed action (alternative 2), and alternative 3. Table 20 p. 56 displays the alternatives in comparative form. This chapter also describes alternatives considered but dropped from detailed analysis (p.54). Project design features and mitigation measure are provided starting on page 43. 1502.15, the affected environment and 1502.16 environmental consequences for each resource, are presented in Chapter 3 of the DEIS.

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Please assure that the natural resources that the P&N will enhance will really be improved.	4	Please refer to the Vegetation section in the DEIS, p. 82, for the effects of the proposal to the vegetation resources within the project area.
It's unethical to include resources that are claimed to be improved by project implementation in the P&N when the project will actually harm these resources.	4	The purpose and need statements address the vegetation management needs within the project area to, in part, reduce densities and create early seral conditions to improve or enhance resiliency to natural disturbances. Refer to the Vegetation section for the beneficial effects to the resources
The EPA generally encourages the inclusion of enhancement of watershed health and improvement in fish habitat and water quality in purpose and need statements for vegetation management projects. Inclusion of watershed health in purpose and need statements promotes inclusion of activities that will reduce sediment delivery to surface waters and improve aquatic health along with forest health. The NOI identifies potential impacts to populations of westslope cutthroat trout from treatment activities, and potential increased runoff and erosion among the issues identified during previous scoping for the project. We encourage the Forest Service, therefore, to consider including in the project purpose and need enhancement of watershed health, fish habitat and water quality. Inclusion of watershed enhancement activities in the project will promote sediment reduction to offset sediment production associated with timber harvest and road construction, which will promote improved water quality, fisheries and watershed conditions, as well as improved vegetative conditions, as a result of the project.	11	The purpose and need is focused on vegetation management. The DEIS explains that while the purpose and need will not be expanded to include enhancement of watershed health, fish habitat and water quality**,** the project is designed for protection of water quality and aquatic habitat with the implementation of RCA buffers and road BMPs to reduce sediment production and improve road surface drainage**.**
We encourage consideration of water quality and fisheries protection, restoration and enhancement to be included in purpose and need statements for land management projects; particularly where water quality impaired waters needing restoration may be involved.	11	
Because the proposed project has the potential to affect water quality both positively and negatively, the WPS requests the Forest consider the inclusion of water quality restoration or watershed protection as a purpose and need for the project.	15	The Hydrology section of the DEIS, p. 281 reveals that BMPS will reduce the current sedimentation rate from use of roads.
In closing, we encourage the Forest to consider water quality protection and restoration as one of the primary needs and purposes of the project.	15	
Proposed Action		

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The only criticism may be that the proposed action is somewhat conservative in addressing a serious epidemic. The proposed action of treating 5,591 acres of the total 44,493 acres in the management unit constitutes treating slightly more than 12.5% of the area. Considering that 70% of the lodgepole pine stands within the management unit have been affected by the mountain pine beetle, treating only 12.5% of the area may be just a start to active resource management.	5	Proposed treatment of lodgepole pine stands is actually slightly higher, when the numbers reflect only lodgepole pine dominated stands within the project area. With a total of 18,141 acres of lodgepole pine dominated stands, Alternative 2 proposes to treat 13.3% (6.4% salvage; 6.9% prescribed burn) and alternative 3 proposes to treat 12.5% (5.6% salvage; 6.9% prescribed burn). When existing seedling stands (1,181 acres or 6.5%) are factored in, about 19% of lodgepole pine stands would be in an early seral condition post treatment. In addition, 1,048 acres of sapling sized stands, mostly comprised of lodgepole pine, would be precommercial thinned with either action alternative.
The scoping package indicates that commercial timber harvest will occur on 5,700 acres as part of the Proposed Action.	10	The June 7, 2011 scoping letter identified approximately 5,700 total acres of treatment. Of that total, 2,573 acres involved commercial timber harvest.
Also, the scoping notice did not define why the Forest Service wants to create early seral stages. Why is this important for forest resources? Although various logging acreages (clearcutting and partial logging) were projected in the Forest Plan, there 'vas never any analysis as to why these plans were needed to manage public lands.	13	The purpose and need has been revised (DEIS, p. 4) to describe why early seral conditions are needed. The desired condition for lodgepole pine forests is to maintain a patch mosaic of forested size classes. Forest vegetation structure provides the basis for maintaining or restoring forested ecological communities

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		of sufficient diversity to provide for the viability of the majority of species that occur or make use of the forested types on the BDNF (FP FEIS p. 473).
Alternatives		
Please provide an alternative that eliminates units that have noxious weeds present on roads within units from fire management proposals.	1 and 12	This comment is addressed in more detail in the DEIS p. 130. All proposed treatment units and access routes were surveyed in 2011 for presence of invasive plants. Based on these surveys, there are no prescribed burn units that have invasive plants present along roads within the units, figure 25.
Please include an alternative in the DEIS that includes land management standards that will prevent new weed infestations by addressing the causes of weed infestation.	1 and 12	Required weed prevention practices and measures have been incorporated into the proposed action, DEIS project design features and mitigation measures, p. 43. These practices are Forest Service policy and procedure for any Forest Service project or management action that may result in ground disturbance. The action alternatives have applied the policies and procedures in a site-specific manner to minimize the likelihood of invasive plant establishment and spread during proposed project implementation.
Please include an alternative that excludes burning in the presence of whitebark pine regeneration (consider ‘Daylighting’ seedlings and saplings as an alternative restoration method).	1 and 12	This comment is addressed in more detail in the DEIS, p. 10. Both action alternatives are

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		designed to exclude burning in the presence of whitebark pine.
We request the FS design a restoration/access management plan for project area streams that will achieve recovery goals.	1 and 12	The comment is addressed in the DEIS p.55. This alternative was not analyzed in detail because it does not meet the purpose and need to manage for the specific vegetation types identified in the proposed action and scoping letter. A foreseeable project on the Pintler Ranger District will address which roads, trails, and areas are to be designated for motor vehicle use. This will address access management with respect to motor vehicles in the analysis area, including access to streams. The results of this foreseeable project will be published on a motor vehicle use map, and made free to the public.
What minimum standards are in the BD National Forest Plan to address noxious weed infestations? The failure to include preventive standards violates NFMA because the Forest Service is not ensuring the protection of soils and native plant communities] Additionally, the omission of an EIS alternative that includes preventive measures would violate NEPA because the Forest Service would fail to consider a reasonable alternative.	1 and 12	The Beaverhead-Deerlodge Forest Plan contains a noxious weed objective that states: Prevent, reduce, or eliminate infestations of nonnative or noxious weed species with emphasis on areas where there is a high likelihood of establishment and spread. Manage noxious weeds through Integrated Pest Management as described in the most current Beaverhead-Deerlodge Noxious Weed Control Record of Decision.

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		The project design features and mitigation measures identify weed prevention practices that target limiting the spread of invasive species DEIS, chapter 2
Enclosed are five photos of areas within the Analysis Area that I would like to request be considered for inclusion into the project. They are all on tractor operable ground and most have existing access. Photo #5 outlines areas adjacent to the powerline that bisects the analysis area.	2	Portions of what was submitted are now units 68, 69, 71 and 72. The remainder acres submitted for inclusion were not added due to riparian buffers, heritage sites, inoperable ground, and slopes in excess of 35% with no reasonable access.
Areas adjacent to powelines are within the WUI as described in the Granite County Fire Plan and are priority areas for treatment. There are many other opportunities within the analysis area to include infested stands of timber next to existing roads. I am aware that there is a roadside salvage project proposed for many of the roads but most of the infested areas are much deeper than a roadside treatment would address. The MPB infestation is an on-going event. Timber stands that are green today will likely be infested next year. If it is possible, I would like to see flexibility built into the analysis to be able to add areas at a later date. Perhaps you could define the parameters for adding additional areas along existing roads that become infested that would allow you to address them at a later date. Or, you could include all of the areas containing mature trees adjacent to roads that are likely to be infested in the future and retain the option of deleting them from treatment if they are not infested. Because of the time frame associated with completing NEP A on this project, I believe you need to project the conditions on the ground two years from now. Trees that are dead now will likely be unmerchantable by the time treatments on the ground begin. And high-risk stands with a small amount of current mortality from the MPB will likely be heavily infested by that time. I believe you have the tools to make this projection and I would like to see an Alternative based on this [see comment 1] approach.	2	Any improvement or investment within the project area can be considered WUI itself, but not the area around it. In the Granite County Fire Plan, the power lines that run through the project area are identified as within the WUI. The power company that owns the power line actively maintains the fuels under the line as part of their easement. The fuels adjacent to the line do not pose a risk to the line from wildfire so treatment of those fuels would be a secondary benefit. Currently, 100 percent of the lodgepole pine stands with trees 5 inches d.b.h. or larger have been affected by the mountain pine beetle. All suitable acres were looked at for harvest and presented in the updated

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		proposed action.
Please modify the Proposed Action as it is described in the scoping package….Please do no construct any roads (temp or system) for this sale.	10	Alternative 3 was developed and analyzed in response to this comment. Under alternative 3 no new road construction would occur.
We particularly support monitoring and evaluation and incorporation of principles of adaptive management into alternatives, and strategies that maintain and/or restore watershed condition and water quality to fully support beneficial uses.	11	The DEIS p. 54 explains why additional areas in the Flint Foothills project areas would not be considered for harvest in the future, including the use of adaptive management.
Finally, DEQ notes that project monitoring and adaptive management are integral to good land management. We encourage monitoring and adaptive management be incorporated into all project scoping. In the case of the Flint Foothills Vegetation Management project, DEQ encourages the Forest to include water quality protection and restoration metrics and· development of appropriate monitoring strategies for the various alternatives to help guide and ensure a successful project outcome. At a minimum, the Forest could provide	15	The DEIS p. 54 explains why additional areas in the Flint Foothills project areas would not be considered for harvest in the future, including the use of

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a summary description of a monitoring and adaptive management program that will assure resource impacts and benefits are tracked and that adaptive management is suitably applied in achieving project goals.		adaptive management. Monitoring information has been incorporated into resource sections. Future monitoring for this project is identified in the DEIS p. 53.
If there are local groups focusing on watershed/ecosystem recovery, we encourage the Forest Service to consider including a watershed or ecosystem restoration alternative for detailed evaluation, or at least to include watershed/ecosystem restoration elements in the reasonable alternatives.	11	The purpose and need focuses on vegetation management. It will not be expanded to include watershed or ecosystem restoration.
Please include an alternative that recognizes the high value of the mountain pine beetle in creating wildlife habitat both in the short and long term, and therefore includes management conservation strategies that incorporate the value of these infestations as a resource management strategy, including woodpecker conservation areas. We would like to know where these woodpecker conservation areas will be located in the project area and how they will be designed according to the current best science to ensure that keystone woodpecker species are promoted in this heavily-logged landscape.	13	This comment is addressed in the DEIS p.55. The no action alternative provides for dead and dying lodgepole pine stands across the project area, providing habitat affected by the mountain pine beetle in the short and long term. In addition, since particular parameters for managing wildlife were not provided given the mountain pine beetle epidemic, we did not develop a third action alternative. The Forest Plan does not contain direction to identify woodpecker conservation areas.
The current best science includes recommendations of from 20-25% old growth for forest wildlife, including neotropical migratory birds. Please include an alternative that will provide this level of old growth in the project area.	13	This comment is addressed in the DEIS p. 10. Providing old growth at a prescribed level (e.g., the suggested 20-25% recommendation) can be done if

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		old growth exists at that level in the project area. Old growth stands are compilation of several characteristics that develop with time. The current BDNF Forest Plan recognizes the importance of old growth, and provides the Standard that all old growth will be retained. Both action alternatives adhere to the Standard of retaining all old growth. Additionally, the commercial thinning prescriptions would provide old growth characteristics at an earlier trajectory than the no action alternative; therefore, would elevate the overall old growth percentage in the project area.
Agency Guidance		
The EIS should demonstrate coordination with the U.S. Fish & Wildlife Service (FWS) and Montana Department of Fish, Wildlife & Parks (MDFWP) and help assure that alternatives and analyses address issues such as: impacts to quality and capacity of fish & wildlife habitat, road access and forest openings impact upon habitat, security, displacement, and fragmentation and connectivity of wildlife habitat; maintenance of wildlife movement corridors/trails; impacts upon sensitive species, management indicator species (MIS), and species of special concern (e.g., Townsend's big-eared bat, flammulated owl, black-backed woodpecker, fisher, wolverine, westslope cutthroat trout, etc.); and maintenance of high quality habitats and restoration of degraded habitats. Estimated reductions in impact from mitigation should also be addressed.	11	Montana Department of Fish, Wildlife, and Parks was solicited for comments and provided input for the project. Consultation with USFWS concerning impacts to grizzly bears will be conducted.
Additionally, the WPS encourages the Beaverhead·Deeriodge (B-D) National Forest to consider establishing water quality protection and restoration among the primary metrics for assessing alternatives and outcomes of the proposed project	15	Additional watershed restoration elements would not address the purpose and need of the proposal, DEIS, p.4.
Environmental Impacts		
Our goals for the area include fully functioning stream ecosystems that include healthy, resilient populations of native trout. The highest priority management actions in the project area are those that remove impediments to natural recovery. The task of management should be the reversal of artificial legacies to	1 and 12	The Forest Service shares the same goals. Refer to DEIS, p 274,

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allow restoration of natural, self-sustaining ecosystem processes. If natural disturbance patterns are the best way to maintain or restore desired ecosystem values, then nature should be able to accomplish this task very well without human intervention (Frissell and Bayles, 1996).		Desired Condition section.
It has been well-established that site-specific Biological Evaluations (BEs) or Biological Assessments (BAs) must be prepared for all actions such as this. Further, the Forest Service Manual requires that BEs/Bas consider cumulative effects. The Forest Service Manual states that project BEs/BAs must contain “a discussion of cumulative effects resulting from the planned project in relationship to existing conditions and other related projects” [FSM 2672.42(4)]. “Existing conditions” obviously are the current conditions of the resources as a result of past actions.	1 and 12	BEs and BAs have been prepared as appropriate and summarized in the DEIS.
Please consider using the Stewardship Contracting authority to guide the operational phase of this project. This approach could increase the acres of pre-commercial thinning and address road maintenance and fisheries issues-to name a few within the analysis area.	2	Stewardship contracts are designed as long term (10 year) integrated projects. The condition of the timber commodity, dead lodgepole pine, does not lend itself to a long term contract. By the midpoint of the stewardship contract the value could be greatly diminished.
The project area is very large. It is not clear how direct effects will be measured.	3	Each resource specialist identified relevant spatial and temporal boundaries for their analysis; the boundaries vary for each resource. For example, the soils spatial boundary is the treatment units, and the temporal boundary is the 20-30 years post implementation. For vegetation, the spatial boundary is the project area and the temporal boundary is 50 years post implementation. See the environmental consequences section in Chapter 3 of the DEIS. (. Each resource analyzed the site specific direct impacts (caused by the action and occur at the same time and place,40 CFR 1508.8) and

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		indirect impacts (caused by the action and are later in time or further removed in distance, but are reasonably foreseeable, 40 CFR 1508.8). The cumulative effects analyses considered relevant past, present and reasonably foreseeable future projects identified within their spatial and temporal boundaries. Relevant past vegetation and prescribed burning activities within the project area are identified in the introduction to chapter, 3, Present and reasonably foreseeable actions in the project area are identified in table 24 of the DEIS and displayed in D-4 in appendix D. Projects outside of the project area are identified in the resource analysis sections, where relevant to the analysis. The Forest Service Handbook (FSH) 1909.10, section 15.2 addresses bounding. It states: “Spatial and temporal boundaries are the two critical elements to consider when deciding which actions to include in a cumulative effects analysis. Spatial and temporal boundaries set the limits for selecting those actions that are most likely to contribute to a cumulative effect. The effects of those actions must overlap in space and time for there to be potential cumulative effects.”

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		Section 15.2a states: “Spatial boundaries define the affected area for each resource indicator. The affected area is the area in which a specific resource may be affected by management actions; whether they are past, present, or future. Affected areas can vary in size by resource and by the type of effect that may occur.”
The Final EA or FEIS must include an MOU from the USFWL. On January 10, 2001, President Clinton signed E.O. 13186, which described the responsibilities of federal agencies to protect migratory birds. One of the requirements of E.O. 13186 is that ``Each Federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations is directed to develop and implement a Memorandum of Understanding with the Fish and Wildlife Service that shall promote the conservation of migratory bird populations."	4	Migratory birds as related to the MOU with the USFWS are evaluated in the wildlife report, and summarized in the Wildlife section of the DEIS p.231.
I have seen the job that can be done with timber harvesters and forwarder type machines and for what it is worth, I think it leaves the mountain in better shape than the traditional skidders do.	7	All harvest methods are being considered in order to meet forest plan standards for soil disturbance. The most economically efficient harvest methods will be utilized during treatment while maintaining forest plan standards.
In accordance with EPA responsibilities under NEPA and Section 309 of the Clean Air Act, EPA will review the draft EIS prepared for this proposed project. EPA's review will include evaluation of the anticipated environmental impacts as well as the adequacy of the EIS in meeting procedural and public disclosure requirements of NEPA.	11	Thank you for your guidance and comments. The Air Quality section of the DEIS, p.101, discloses how Federal Land Managers participate in the Smoke Management Program.
At this early stage in project planning we are transmitting EPA's general EIS guidance and scoping comments for this type of project for your consideration (see enclosed).EPA's intent is to promote full public disclosure of all foreseeable direct, indirect, and cumulative environmental impacts and mitigation, and consistency with environmental and public involvement requirements of State and Federal laws, Executive Orders and policies. We hope this will lead to an improved decision-making process for selecting among alternatives.	11	Thank you for your guidance and comments

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The twin goals of the National Environmental Policy Act (NEPA) to consider environment effects and inform the public can only be met with clear disclosure of effects of proposed actions on the environment. Our experience has shown that when environmental concerns are thoroughly evaluated, the EIS is a more meaningful document that will lead to better decisions.	11	The environmental effects are disclosed within the resources sections in Chapter 3 of the DEIS
If watershed restoration work will be committed to with the project decision that should be clearly stated. If watershed restoration work is to be carried out only as available funding allows, the potential funding source and likelihood of funding or priority and estimated timetable for implementation should be identified.	11	The alternatives do not include explicit restoration work. Project design features that improve environmental conditions (i.e. best management practices) and mitigation measures (i.e. soil subsoiling) are required components of the commercial timber sale actions associated with salvage by clearcutting, commercial thin seed tree harvest. These activities would be funding through either the timber sale contract or appropriated funding.
Also, if there are any proposed nearby actions or adjacent developments that are closely related to the proposed action it would be appropriate to analyze and discuss those related developments as a connected action (40 CFR 1508.25).	11	No connected actions were identified. Per 40 CFR 1508.25: Actions are connected if they: (i) Automatically trigger other actions which may require environmental impact statements; (ii) Cannot or will not proceed unless other actions are taken previously or simultaneously ;(iii) Are interdependent parts of a larger action for their justification.
Cumulative Effects		
Even though ecological restoration is not the project's priority, the NEPA document must at least identify all the existing ecological liabilities caused by past management actions. This includes poorly located or poorly maintained roads, high-risk fuel situations caused by earlier vegetation manipulation projects, wildlife security problems by open motorized roads and trails plus those that are closed but violated—and include all those impacts in the analyses.	1 and 12	The resource information provided in the Affected Environment narratives in Chapter 3 of the DEIS includes the effects of relevant past actions that may still be contributing effects to the

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		resource and therefore are considered as part of the existing condition. Road maintenance and improvement is discussed in the Transportation section of the DEIS, p. 110. Wildlife secure areas and wildlife security areas are address in the Wildlife section of the DEIS p. 155. Because the purpose and need does not contain a “fire risk” component there is not a fuels section of the DEIS, though, all fuels accumulations as a result of past activities have been treated. Since existing conditions are results of past actions, any possible high-risk fuel situations caused by earlier vegetation manipulation were not identified.
Please define the cumulative effects of various other projects on the BDNF that are planned that will also increase noxious weed infestations. We would like to know the cumulative expected increase in noxious weeds from all currently-planned and proposed logging and burning projects on the Forest, and what the impacts to wildlife will be.	3	Table 24 identifies all of the known present and reasonably foreseeable actions relevant to spatial and temporal boundaries associated with the cumulative effects analyses for the Flint Foothills Project. These boundaries do not encompass the BDNF. No other future vegetation (logging) or prescribed burning proposals are identified. The invasive plant analysis in the DEIS p. 139, and the wildlife analysis (p. 143) under each individual habitat and species

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		describes the cumulative effects from relevant projects.
Cumulative impacts of roads and past logging is a huge negative on this landscape. Please address all the factors that these old roads and harvest units that are degrading wildlife habitat, including for big game, forest raptors, neotropical migratory birds, old growth species, species dependent upon snags, and Montana species of concern.	13	Past road construction and timber harvest are identified as contributing to the existing condition for a number of wildlife species analyzed in the Wildlife section of the DEIS p. 143
Monitoring		
For every project proposal, it is important that the results of past monitoring be incorporated into planning. All Interdisciplinary Team Members should be familiar with the results of all past monitoring pertinent to the project area, and any deficiencies of monitoring that have been previously committed to. For that reason, we expect that the following be included in the NEPA documents or project files: • A list of all past projects (completed or ongoing) implemented in the proposed project area watersheds. • The results of all monitoring done in the project area as committed to in the NEPA documents of those past projects. • The results of all monitoring done in the proposed project area as a part of the Forest Plan monitoring and evaluation effort. • A description of any monitoring, specified in those past project NEPA documents or the Forest Plan for proposed project area, which has yet to be gathered and/or reported.	1 and 12	A list of past vegetation and prescribed burn projects is provided in table 21, table 22and table 23 at the beginning of chapter 3. Past project information and monitoring information relevant to the resource analyses has been incorporated into resource reports and summarized in the DEIS. Past project and monitoring information is on file at the Beaverhead-Deerlodge National Forest.
Please disclose the names of all other past projects (implemented during the life of the Forest Plan) whose analysis area(s) encompass the areas to be “treated” under this proposal. Please disclose if the FS has performed all of the monitoring and mitigation required or recommended in any NEPA documents, and the results of the monitoring.	1 and 12	The Beaverhead-Deerlodge NF Forest Plan was completed in 2009. Roadside 4 is the only other vegetation project which is occurring within the Flint Foothills project area. Roadside 4 has not been completed, so whether or not all mitigation and monitoring has occurred is unknown at this time.
What long term monitoring of weed populations is proposed?	1 and 12	Noxious weed infestations within the Flint Foothills project area will continue to be managed into the

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		reasonably foreseeable future using an integrated pest management approach that is consistent with control methods described in the Beaverhead-Deerlodge National Forest Noxious Weed Control Record of Decision. Treatment implementation and effectiveness monitoring of these infestations will occur on an annual basis by district weed control crews and be reported in the Forest Service's Activity Tracking System (FACTS) database consistent with Forest Plan Monitoring Direction.
Monitoring (Is pre- and post-project monitoring proposed?).	11	Pre- project data is gathered through a combination of formal surveys and walk though examinations. Specific post-project implementation monitoring items are identified in the DEIS, p.53. Forest Plan Monitoring and Evaluation is discussed in the Forest Plan, pp. 271-280. Typically, each timber sale is reviewed for implementation and effectiveness of project design features and mitigation measures, as well as resource issues important to the individual sale.
The EPA also recommends consideration of a biological component, such as rapid bioassessments using macroinvertebrates, in a monitoring program	11	The B-D Forest Plan has identified the mayfly *Drunella doddsi* as a management indicator species, is addressed in the Aquatics section of the DEIS, p. 318, and is included in the Forest Plan Monitoring and

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		Evaluation Strategy, FP, p. 275.
Opposing Science		
It is our intention that you include in the record and review all of the literature and other incorporated documents we've cited herein. Please contact us if you have problems locating copies of any of them.	1 and 12	The resource specialists working on this project have been provided and reviewed the literature provided by commenters and incorporated it to the extent that it is applicable to the site-specific environmental analysis documented in this DEIS. Documentation of literature reviews is provided in the DEIS, appendix B table B-2.
The Science Statements Contained in the Opposing Science Attachments are Best Science. You will notice several attachments to this comment letter. These attachments contain statements (and links to the statements) written by biological scientists indicating the damage that will be inflicted to the natural resources of the forest when and if the Foothills Vegetation Management project is implemented. Please keep in mind that the Responsible Official must discuss opposing science submitted by the public. The courts have shown that 40 C.F.R. § 1502.9(b) is not trivial. This discussion will explain to the public why the project treatments are inconsistent with opposing science, or how the project complies with opposing science. Appendix A of these comments contains links to 4 opinions handed down in federal court against the Forest Service and BLM in instances where the Responsible Official failed to respond to opposing science. Appendix A also cites the CFR that requires these agency discussions of opposing science. The law also requires the Responsible Official to place their opposing science responses in the final EIS or EA for the general public to read. This provides the public with some insight into the rationale and data used by the Responsible Official to make the final Decision. The scoping letter for the Foothills Vegetation Management project indicates that the following treatments will occur. Timber Harvest: approximately 2,322 acres Road Construction miles: 7 miles of temporary road Prescribed Burning: 2,230 acres The Responsible Official's Final DN or ROD Must be Guided by and Comply with Best Science. Please see the court precedent and direction below *(in literature review).*	4	The resource specialists have reviewed the literature provided by commenters and incorporated it to the extent that it is applicable to the site-specific environmental analysis documented in this EIS. Documentation of the literature reviews is provided in the DEIS, appendix B, table B-2 All literature used in the analysis is properly cited.

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Indeed, Forest Service projects must be consistent with and based on best science. Please see the court precedent and direction below. "The 1982 forest planning regulations at 36 C.F.R. Part 219 were superseded in November 2000, when new regulations were promulgated. 65 Fed. Reg. 67,568 (Nov. 9, 2000). Under the transition provision of the 2000 regulations, the Forest Service was required to consider the "best available science" when implementing site-specific projects within a forest plan. 36 C.F.R. 219.35(a) (2001)." Source: The Ecology Center, Inc., v. United States Forest Service United States Court of Appeals, Tenth Circuit, June 29, 2006 An Appeal from the United States District Court for the District of Utah (D.C. No. 2:03-CV-589-TS) http://caselaw.lp.findlaw.com/scripts/getcase.pl?navby=search&case=/data2/circs/10th/ 054101.html "The purpose of this interpretative rule is to clarify that, both for projects implementing plans and plan amendments, paragraph (a)'s mandate to use the best available science applies." Source: Federal Register / Vol. 69, No. 188, page 58056 Wednesday, September 29, 2004 Rules and Regulations http://www.fs.fed.us/r1//projects/plan_rule/intrpretative-rule.pdf Since 1992 Forest Service leaders and spokespeople have publically stated that Forest Service projects will be grounded in best science. 40 C.F.R. § 1502.9(a) requires the Responsible Official to disclose any dissenting scientific views in draft EISs and pre-decisional EAs, An excerpt from Friends of the Earth v. Hall , 693 F. Supp. at 924 states: "Where scientists disagree about possible adverse environmental effect, the EIS must inform decision-makers of the full range of responsible opinion on the environmental effects." Where the agency fails to acknowledge the opinions held by well respected scientists concerning the hazards of the proposed action, the EIS is fatally deficient. The FEIS and FSEIS text failed to disclose the opposition of what must be acknowledged as credible, reliable scientific sources. Here again, the court concludes that based on the circumstances of this case the 'appropriate point' to disclose and address these 'opposing views' was in the body of the EIS, rather than the comments and response section." If the Responsible Official chooses to reject opposing scientific views by claiming that they were "not responsible" and/or the source of the opposing view is not "credible" or, "reliable', please provide the name, education and experience of the Forest Service employee(s) who made these conclusions. When the proposed project ignores or is inconsistent with opposing scientific views, I ask the Responsible Official to cite science literature that refutes the opposing science and supports the proposed project treatment. The Timber Removal Process Damages the Proper Functioning of Several Natural Resources in the Forest. The proposed Foothills Vegetation Management project will harvest timber on 2,322 acres. The Forest Service frequently tells the public that the timber harvest will either; Restore the natural resources of the		

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forest in the project area, or Enhance the health of the forest in the project area, Best science tells us otherwise. Please see Opposing Science Attachment #1. The science literature that supports the proposed project treatments should be written by unbiased, independent scientists with nothing to gain if the project is implemented and nothing to lose if the project is withdrawn If you decide to redesign this project to comply with "best science," your current project proposal will disappear. A new project proposal must pass through the NEPA process again starting with a new scoping letter. Please send me your new scoping letter. Responsible Officials must respond individually to each opposing scientific statement. These responses MUST (emphasis added) be contained in the body of the final EIS or EA. *The links to the complete opinion are included in the literature review.* League of Wilderness Defenders et al. v. Elaine Marquis-Brong. In the United States District Court for the District of Oregon, Judge Ancer L. Haggerty,Civil No. 02-75-HA. April 18, 2003, League of Wilderness Defenders et al. v. United States Forest Service. In the United States District Court for the District of Oregon, Judge Ancer L.Haggerty, Civil No. 04-488-HA. November 19, 2004, and Blue Mountains Biodiversity Project et.al v. Blackwood, 161 F.3d 1208, 1211 (9th Cir.1998). Betty B. Fletcher, circuit Judge. Appeal from the United States District Court for the District of Oregon Ann Aiken, District Judge, Presiding. Center for Biological Diversity v. U.S. Forest Service, 349 F.3d 1157 (9th Cir. 2003). Donald C. Pogue, circuit court Judge. Appeal from the United States District Court for the District of Arizona, Robert C. Broomfield District Judge Presiding. Friends of the Clearwater et al. v. D. Robert Lohn et al., In the United States District Court for the District of Idaho, Judge Edward J. Lodge, CV04-384-C-EJL, March 31, 2005. This requirement is explained in detail in the complete opinions. Links to the complete opinions are shown for each court case. In each court case the judge ruled for the plaintiff. I am not surprised that the USFS was the defendant in 4 out of 5 decisions. In reading the full text of the 4 court opinions some things will become clear: 1) If the Forest Service attempts to discredit any opposing science statement, they must cite convincing, unbiased, independent science refuting the opposing science conclusion. 2) If the Forest Service attempts to avoid a detailed response to the adverse ecological effects discussed in the opposing science by claiming to have applied specific mitigation treatments, the USFS must include citations explaining the mitigation effectiveness under similar circumstances. 3) The Forest Service cannot attempt to avoid a detailed response to the adverse ecological effects discussed in the opposing science by claiming that the science conclusions were based on another project at another time in another area. In the vast majority of cases, the scientists that authored the opposing science		

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statements intended that their statements apply anywhere that a similar treatment is proposed. For the USFS to prove otherwise, they must dissect the opposing statement to find wording that it applies in only one location. 4) If the Forest Service attempts to avoid a detailed response to the adverse effects discussed in the opposing science by claiming they have followed forest plan direction, the USFS must cite the specific forest plans sections used (and FP page(s) and describe past situations similar to the one at hand where the application of forest plan direction minimized the impact of the treatment and for how long. 5) Unsubstantiated Forest Service's statements of agreement or disagreement with the opposing science is irrelevant. The law requires the USFS to respond to opposing science. If the USFS believes that the opposing science is untrue, then the USFS must explain why it is untrue and cite science on the same subject that is true. Please indicate a) the individual(s) who disagree with the opposing science and their education/experience and c) the reason for the disagreement. If the Responsible Official determines that the opposing science is not valid, the Responsible Official should disclose the employees who made the determination and the basis for their conclusion. This commenter will submit this information to the scientist who made the opposing science statement and the scientist will respond to the individuals on the forest. In most cases, the opposing science daylights the adverse ecological effects of proposed USFS treatments. Of course the Responsible Official does not want such information to be disclosed publically. Thus, they will use the 5 excuses listed above to convince the public that they need not respond. The CFR clearly intends for the Responsible Official to describe why the opposing science was or was not considered in the project design. Addressing the opposing science is not a "we agree" and "we don't agree" exercise! As the opposing science shows, there are no exceptions. Every commercial timber sale inflicts major long-term harm to the forested ecosystem within the cutting units. Some Forest Service line-officers deny that there will be adverse effects and others will do anything to hide the adverse effects. A Federal judge will recognize both. If the opposing science was used, then the final NEPA document should provide the NEPA document pages with the citation to the opposing science literature. Forest Service Responsible Officials must Treat the National Forests with Care and Manage this Land that Belongs to the Public According to the Wishes of the Majority of Owners. Attachment #13 displays the results of 18 statistically significant nationwide polls *(see literature review)*. The 18 poll results indicate that an average of 71% of the respondents oppose logging in national forests. This the opposition percentage ranges from a low of 60% to a high of 94%. Please include the results of these 18 polls in the final EA. Such information is needed for the public reader of the EA to put the project in perspective and determine the tradeoffs of timber harvest vs. the need for		

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undeveloped public land. The mandate of the U.S. Forest Service is to administer the national forests owned by 306 million Americans to assure their conservation and protection. They are managed to assure that an unimpaired landscape will be available for future generations to enjoy. As the future decades pass and the population will increase. Undeveloped land will become priceless to the majority of Americans seeking to escape the stressful conditions that exist in society. This need is reflected by the majority of Americans today. The vast majority of Americans object to commercial logging of their national forests If there are polls/surveys or other sources available showing that the majority of Americans approve of commercial timber harvest in their national forests, please include the results of these polls in the final EA. The Responsible Official MUST Address the Opposing Science Submitted by the Public in the Final NEPA Document The law is clear: 40 C.F.R. § 1502.9(b) requires that: “The agency shall discuss at appropriate points in the final statement any responsible opposing view which was not adequately discussed in the draft statement and shall indicate the agency's response to the issues raised.” Source: http://ceq.hss.doe.gov/nepa/regs/ceq/1502.htm#1502.9 Note that agencies are not allowed to pick and choose scientists. To reject a scientific statement, the Forest Service must provide a convincing argument that the opposing science statements are not responsible or irresponsible. Attempting to reject an opposing science statement by claiming it came from literature that has not been peer reviewed does not indicate that the scientist is irresponsible. Attempting to reject an opposing science statement by claiming that the scientist who authored the statement is not recognized or well respected does not indicate that the scientist is irresponsible. Opposing science statements are attached to this comment letter. Each science attachment describes statements made by Ph.D. biological scientists (mostly college professors) that explain why actions identical to those proposed in this project will 1) harm the natural resources in the project area, and/or 2) will not accomplish one or more objectives described in the Purpose and Need. Based on the opposing science statements contained in the attachments in this letter, the Proposed Action for this project does not comply with bestscience. Indeed, the Forest Service has publically announced an interpretative rule telling the public that their projects to be consistent with best science. “This uncertainty has affected the ability of the Forest Service toutilize fully the provisions of § 219.35 paragraph (a) to consider the best science available in plan amendments and project decision making. For example, while population data have been held to be required for management indicator species under the 1982 rules, other tools often can be useful and more appropriate in predicting the effects of projects that implement a land management plan, such as examining the effect of proposed activities on the habitat of specific species; using information identified, obtained, or developed through a variety of methods, such as assessments, analysis, and monitoring results; or using information obtained from other sources such as State fish and wildlife agencies and organizations such as The Nature Conservancy. The purpose of this interpretative rule is to clarify that, both for projects implementing plans and plan amendments, paragraph (a)’s mandate to use the best available science		

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applies." Federal Register / Vol. 69, No. 188, page 58056 Wednesday, September 29, 2004 Rules and Regulations http://www.fs.fed.us/r1//projects/plan_rule/intrpretative-rule.pdf Forest Service leaders and spokespeople have emphasized this direction by promising to the public that all (emphasis added) Forest Service projects will be grounded in best science. Please see Attachment #15.		
Please see the attached Region 1 report on how (in) accurate canopy cover mapping is under the Forest Service's VMAP system. The Northern Region (R1) of the United States Forest Service (USFS) is responsible for managing vegetation for a variety of uses while maintaining the integrity of ecosystem function over regional and local scales. Effective resource planning, analysis and monitoring strategies, in turn, require reliable, consistent and continuous existing vegetation data products. In meeting this need, the R1 Geospatial Group has recently produced the attached vegetation map product, in pdf format, called R1- VMap. It is a spatially explicit, thematic, polygon-based product derived from remotely sensed data that contains information about the extent, composition, and structure of vegetation across National Forest System land in R1. Thank you for your continued attention to these concerns. The results of the report calls into question if the Forest Service is complying with NFMA and NEPA. Please respond to this report. Thank you for your continued attention to these concerns.	12	VMap is a multi-level geospatial database used to produce map products: lifeform, tree canopy cover class, tree diameter and tree dominance type for forested types and non-forest map classes for grassland and shrubland vegetation communities. VMap is a remote sensing derived product, using a combination of satellite imagery and airborne acquired imagery. The resulting imagery is aggregated into spatially cohesive polygons, from which a small sample are then examined through aerial photo interpretation and field data collection to determine their composition. This small sample was then used to give unsampled polygons labels based on an analysis of the sampled polygons. The draft map products were then field verified with appropriate changes made to the labeling algorithms. The Beaverhead-Deerlodge data was field verified over two field seasons. Additional project level field verification and adjustments were made for the Flint Foothill project-level analysis, and are reflected in the vegetation analysis. (Brown and Barber

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		2011)
Rational for the Decision		
Please explain the rationale used by the Responsible Official when determining that the positive effects claimed to result from the Foothills Vegetation Management project are more important than the wishes of the public. Include this explanation in the EA. The most important thing to remember when designing projects is the publically owned national forests are not places to give resource extraction corporations opportunities to generate profits.	4	The Flint Foothills project addresses goals and objectives in the Forest Plan, which includes utilizing forest products, See the purpose and need for action, and associated Forest Plan goals and objectives, DEIS p. 4.
Costs		
Please evaluate all of the costs and benefits of this project. Please include a detailed list of all the costs to the agency and the public.	1 and 12	All agency financial costs and benefits are addressed in the Economics section of the DEIS, p. 397, detailed in tables and used in a financial efficiency analysis. Other non-market costs and benefits can be ascertained by reviewing all sections of the DEIS.
It is not clear that salvage harvest will be economical, even though this is stated as one purpose of the project. If this sale -will cost the public money, this should be clearly identified and noted in the purpose and need of the project. Otherwise, the rationale for logging is misleading the public.	13	The results of the financial efficiency analysis allow a present net value comparison of the costs to the government versus the expected revenues based on current plans to harvest in the near future. This is split for the reader into a present net value of the timber harvest alone and a present net value of all activities, including timber harvest and other project activities.
Vegetation Management EPA General Guidelines		

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In regard to vegetation management, EPA generally favors understory thinning from below, slashing and prescribed fire treatments for managing vegetation to reduce fuels and fire intensity, as well as address forest insect, disease and other forest health issues, with retention of la large, healthy, fire resistant trees, particularly retention of declining tree species (e.g., Ponderosa pine, whitebark pine, aspen), and retention of adequate snags and woody debris to maintain wildlife habitat and soil productivity.	11	This project does not include a purpose and need for reducing fuels or fire intensities, nor does it include a purpose and need for forest insect, disease and other forest health issues with its proposed actions, DEIS, p.4. However, the proposed treatments (thinning and prescribed fire) in lower elevations are designed to thin from below, with the prescription of retaining large trees, especially ponderosa pine. Aspen and whitebark pine would be retained where they occur in all proposed treatments. Additionally, FP standards for snags and downed woody debris for both wildlife habitat and soil productivity would be met.
Vegetation – Noxious Weeds/Invasive Plants/Herbicide Use		
Noxious Weeds/Invasive Plants		
Please address the ecological, social and ascetic impact of current noxious weed infestations within the project area. Include an analysis of the impact of the actions proposed by this project on the long and short term spread of current and new noxious weed infestations. What treatment methods will be used to address growing noxious weed problems? What noxious weeds are currently and historically found within the project area? Please include a map of current noxious weed infestations which includes knapweed, Saint Johnswort, cheat grass, bull thistle, Canada thistle, hawkweed, hound's-tongue, oxeye daisy and all other Category 1, Category 2 and Category 3 weeds classified as noxious in the MONTANA COUNTY NOXIOUS WEED LIST.	1 and 12	See the Invasive Plant section of the DEIS starting on p. 129 for the existing condition, desired condition, environmental consequences of this project on invasive species; included is a, map of invasive species found within the Flint Foothills project area. Treatment of noxious weeds will be an ongoing activity within the Flint Foothills project area and will be consistent with direction found in the Beaverhead-Deerlodge Noxious Weed Control Record of Decision (2002).

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State-listed Category 2 noxious weed species yellow and orange hawkweeds are recently established (within the last 5 to 10 years) in Montana and are rapidly expanding in established areas. They can invade undisturbed areas where native plant communities are intact. These species can persist in shaded conditions and often grow underneath shrubs making eradication very difficult. Their stoloniferous (growing at the surface or below ground) habit can create dense mats that can persist and spread to densities of 3500 plants per square mile (Thomas and Dale 1975). Are yellow and orange hawkweeds present within the project area? Please address the cumulative, direct and indirect effects of the proposed project on weed introduction, spread and persistence that includes how weed infestations have been and will be influenced by the following management actions: road construction including new permanent and temporary roads, and skid trails proposed within this project; opening and decommissioning of roads represented on forest service maps; ground disturbance and traffic on forest service template roads, mining access routes, and private roads; removal of trees through commercial and pre-commercial logging and understory thinning; and prescribed burns. What open, gated, and decommissioned Forest Service roads within the project area proposed as haul routes have existent noxious weed populations and what methods will be used to assure that noxious weeds are not spread into the proposed action units?	1 and 12	Yellow and orange hawkweeds were not found during the 2011 weed inventory, Invasive Plant section of the DEIS, pp. X-X The cumulative, direct and indirect effects were discussed on pp. 137-139 under alternative 2 – proposed action. Invasive species were mapped in 2011. Please see the map, figure 25 on page 133 for current invasive species locations along roads. Project design features and mitigation measures have been integrated into the proposed action to limit the spread of invasive species, DEIS p. 43. In addition, in accordance with the Beaverhead-Deerlodge National Forest Noxious Weed Control EIS (2002), treatments of existing invasive species infestations would continue to occur on an annual basis with an integrated pest management approach.
Noxious weeds are not eradicated with single herbicide treatments. A onetime application may kill an individual plant but dormant seeds in the ground can still sprout after herbicide treatment. Thus, herbicides must be used on consistent, repetitive schedules to be effective. What commitment to a long-term, consistent strategy of application is being proposed for each weed infested area within the proposed action area?	1 and 12	Invasive species infestations within the Flint Foothills project areas will continue to be managed into the reasonably foreseeable future using an integrated pest management approach that is consistent with control methods described in the Beaverhead-Deerlodge National Forest Noxious Weed Control Record of Decision (2002). Treatment

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		implementation and effectiveness monitoring of these infestations will occur on an annual basis by district weed control crews and be reported in the Forest Service's Activity Tracking System (FACTS) database consistent with Forest Plan Monitoring Direction.
The scientific and managerial consensus is that prevention is the most effective way to manage noxious weeds. The Forest Service concedes that preventing the introduction of weeds into uninfested areas is "the most critical component of a weed management program." The Forest Service's national management strategy for noxious weeds also recommends "develop[ing] and implement[ing] forest plan standards . . ." and recognizes that the cheapest and most effective solution is prevention	1 and 12	The presence of invasive species within the treatment units of the proposed action is displayed in the Invasive Plant section of the DEIS, figure 25, p 133.
Which units within the project area currently have no noxious weed populations within their boundaries?		
One of the biggest problems with the FS's failure to deal forthrightly with the noxious weed problem on a forest wide basis is that the long-term costs are never adequately disclosed or analyzed. The public is expected to continuously foot the bill for noxious weed treatments—the need for which increases yearly as the BDNF continues the large-scale propagation of weeds, and fails to monitor the effectiveness of all its noxious weed treatment plans to date. There is no guarantee that the money needed for the present management direction will be supplied by Congress, no guarantee that this amount of money will effectively stem the growing tide of noxious weed invasions, no accurate analysis of the costs of the necessary post-treatment monitoring, and certainly no genuine analysis of the long-term costs beyond those incurred by site specific weed control actions.	1 and 12	The Beaverhead-Deerlodge National Forest takes the responsibility to prevent and eliminate invasive species very seriously. Crews have been very effective in reducing invasive species in the past (p. 130 of the DEIS). Although the Forest has no control over Congressional appropriations, the Beaverhead-Deerlodge National Forest will continue to have an aggressive invasive species control program commensurate with funding.
What minimum standards are in the BD National Forest Plan to address noxious weed infestations? The failure to include preventive standards violates NFMA because the Forest Service is not ensuring the protection of soils and native plant communities.	1 and 12	The Beaverhead-Deerlodge National Forest Land and Resource Management Plan contains a noxious weed objective that states: Prevent, reduce, or eliminate infestations of non-native or noxious weed species with emphasis on areas where

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		there is a high likelihood of establishment and spread. Manage noxious weeds through Integrated Pest Management as described in the most current Beaverhead-Deerlodge Noxious Weed Control Record of Decision. The proposed action contains weed prevention practices that target limiting the spread of invasive species, (DEIS, p. 136).
Please disclose how the productivity of the land been affected in the project area and forestwide due to noxious weed infestations, and how that situation is expected to change in the co**m**ing years and decades.	1 and 12	The forestwide invasive species situation was discussed in the Beaverhead-Deerlodge National Forest Noxious Weed Control FEIS (USDA Forest Service 2002). On page 3-42 of the FEIS, the existing condition of the effects of weeds on the soil resource is discussed. In short, soil quality indicators are “normal” in infestations that have been treated successfully. On weed-dominated sites that have not been treated or where treatment has not been very effective, “organic matter is lower and structure in the surface soil may have been altered. Erosion rates appear to have increased in some cases.” The Pintler Ranger District has an aggressive and effective invasive species management program. Invasive species infested acres

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		have been reduced by 48% in the last 10 years within the project area (Invasive Plant section, existing condition, p. 130). There is a high likelihood that infested acres would continue to decline into the foreseeable future within the project area. The overall effect of weeds on soil productivity in the project area is discussed in the Soil section of the DEIS, p. 250. In summary, the effects of weeds on soil productivity is very minimal overall, due to limited presence along roadsides (not productive soils), and continuing weed treatments in accordance with the Beaverhead-Deerlodge National Forest Noxious Weed Control Record of Decision (USDA Forest Service 2002). While the potential for impacts to soil productivity exists as a result of noxious weed infestation, the actual impact to long term soil productivity is likely minimal, due to the following: The Invasive Plant resource report describes a low risk of noxious weeds becoming established and/or spreading in proposed treatment units within the analysis area. The mitigation measures listed in

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		the DEIS include monitoring for and treating noxious weeds within units and along roads. Treatment of noxious weeds with herbicides on the Beaverhead-Deerlodge NF has been effective (infested acres reduced by 49% over the last ten years on the Pintler Ranger District) (Rasor 2012). Land productivity forestwide requires higher-level analysis.
Native plants are the foundation upon which the ecosystems of the Forest are built, providing forage and shelter for all native wildlife, bird and insect species, supporting the natural processes of the landscape, and providing the context within which the public find recreational and spiritual opportunities. All these uses or values of land are hindered or lost by conversion of native vegetation to invasive and noxious plants. The ecological threats posed by noxious weed infestations are so great that a former chief of the Forest Service called the invasion of noxious weeds “devastating” and a “biological disaster.” Despite implementation of Forest Service “best management practices” (BMPs), noxious weed infestation on the Forest is getting worse and noxious weeds will likely overtake native plant populations if introduced into areas that are not yet infested. The Forest Service has recognized that the effects of noxious weed invasions may be irreversible. Even if weeds are eliminated with herbicide treatment, they may be replaced by other weeds, not by native plant species. Invasive plant species, also called noxious weeds, are one of the greatest modern threats to biodiversity on earth. Noxious weeds cause harm because they displace native plants, resulting in a loss of diversity and a change in the structure of a plant community. By removing native vegetative cover, invasive plants like knapweed may increase sediment yield and surface runoff in an ecosystem. As well knapweed may alter organic matter distribution and nutrient through a greater ability to uptake phosphorus over some native species in grasslands. Weed colonization can alter fire behavior by increasing flammability: for example, cheatgrass, a widespread noxious weed on the Forest, cures early and leads to more frequent burning. Weed colonization can also deplete soil nutrients and change the physical structure of soils. The Forest Service’s own management activities are largely responsible for noxious weed infestations; in particular, logging, prescribed burns, and road construction and use create a risk of weed infestations. The introduction of logging equipment into the Forest creates and exacerbates noxious weed infestations. The removal of trees through logging can also facilitate the establishment of noxious weed infestations because of soil disturbance and the reduction of canopy closure In general, noxious weeds occur in old clearcuts and forest	1 and 12	Thank you for your comment. The Beaverhead-Deerlodge National Forest agrees with your statements. This is why we have developed strict design features and mitigation measures and have an aggressive integrated approach to reducing invasive species on the Forest.

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openings, but are rare in mature and old growth forests. Roads are often the first place new invader weeds are introduced. Vehicle traffic and soil disturbances from road construction and maintenance create ideal establishment conditions for weeds. Roads also provide obvious dispersal corridors. Roadsides throughout the project area are infested with noxious weeds. Once established along roadsides, invasive plants will likely spread into adjacent grasslands and forest openings.		
Prescribed burning activities within the analysis area would likely cumulatively contribute to increases to noxious weed distribution and populations. As a disturbance process, fire has the potential to greatly exacerbate infestations of certain noxious weed species, depending on burn severity and habitat type (Fire Effects Information System 2004). Soil disturbance, such as that resulting from low and moderate burn severities from prescribed fire and fire suppression related disturbances (dozer lines, drop spots, etc.), provide optimum conditions for noxious weed invasion. Dry site vegetation types and road corridors are extremely vulnerable, especially where recent ground disturbance (timber management, road construction) has occurred. Units proposed for burning within project area may have closed forest service access roads (jammers) located within units. These units have the highest potential for noxious weed infestation and exacerbation through fire activities.	1 and 12	The Invasive Plant section of the DEIS, p. 137, addresses the direct, indirect and cumulative effects associated with invasive species and prescribed burning.
Please define what the current status of noxious weeds is on the BDNF, as per trends of weed infestations, and define how the current project will affect this trend.	3	The analysis for this project focused on NFS land within the project area. The general trend within the BDNF is a decline in the total number of acres infested by invasive species. The project is discussed beginning on p.137 of the Invasive Species section.

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Please define the expected increase in noxious weed infestations after this project is completed	3	Please see the Summary of Effects sections under alternative 2 in the Invasive Plant section of the DEIS, p.140.
What is the expected control of noxious weed infestations that will be generated from this project?	3	The Pintler Ranger District has an aggressive and effective invasive species management program. Invasive species infested acres have been reduced by 48% in the last 10 years with the project area DEIS, p.132, There is a high likelihood that infested acres would continue to decline into the foreseeable future within the project area.
Will the monies and manpower be available to even control new populations of noxious weeds generated by this project, let alone to eliminate them?	3	The Beaverhead-Deerlodge National Forest takes its responsibility to prevent and eliminate invasive species very serious. Crews have been very effective in reducing invasive species in the past, Invasive Plant section, DEIS, p. 132). Although the Forest has no control over Congressional appropriations, the Beaverhead-Deerlodge National Forest will continue to have an aggressive invasive species control program commensurate with its funding.
Please provide a summary of the existing weed infestations, and what the trend in these infestations has been. If weeds are never eliminated in harvest units and along roads, please define the proposal as an irretrievable impact on the environment.	13	Please see the Invasive Plant section of the DEIS, figure 25 in the existing condition, for a summary of existing invasive species infestations.
Herbicide Use		

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Herbicides should be applied at the lowest rate effective in meeting weed control objectives and according to guidelines for protecting public health and the environment. The Montana Water Quality Standards include a general narrative standard requiring surface waters to be free from substances that create concentrations which are toxic or harmful to aquatic life.	11	Herbicides are applied to the Forest in accordance with the Beaverhead-Deerlodge National Forest Noxious Weed Control Final Environmental Impact Statement and Record of Decision 2002 as well as the specific herbicide label specifications.
Vegetation – Native, TES and Rare Plants/Whitebark Pine/Old Growth		
Native, TES and Rare Plants		
When areas treated with herbicides are reseeded on national forest land, they are usually reseeded with exotic grasses, not native plant species. What native plant restoration activities will be implemented in areas disturbed by the actions proposed in this project? Will disturbed areas including road corridors, skid trails, and burn units be planted or reseeded with native plant species?	1 and 12	Use of native seed mix is identified in project design features and mitigation measures, (DEIS p.43) as follows: Constructed skid trails, landings, and temporary roads would be obliterated and revegetated with native seed mix approved by the Forest Service (SWCP 15.25). Landings would be revegetated with native seed and areas of compacted soil would be scarified prior to seeding (SWCP 14.11). Following burning, landings would be reseeded within one year using native seed mix approved by the Forest Service.
The ESA requires that the Forest Service conserve endangered and threatened species of plants as well as animals. In addition to plants protected under the ESA, the Forest Service identifies species for which population viability is a concern as “sensitive species” designated by the Regional Forester (FSM 2670.44). The response of each of the sensitive plant species to management activity varies by species, and in some cases, is not fully known. Local native vegetation has evolved with and is adapted to the climate, soils, and natural processes such as fire, insect and disease infestations, and windthrow. Any management or lack of management that causes these natural processes to be altered may have impacts on native vegetation, including threatened and sensitive plants. Herbicide application – intended to eradicate invasive plants – also	1 and 12	Refer to the Sensitive Plant section of the DEIS, pp. 113 There are no known federally listed threatened or endangered plants on the Beaverhead-Deerlodge National Forest. Surveys were conducted within the project area, targeting

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results in a loss of native plant diversity because herbicides kill native plants as well as invasive plants. Although native species have evolved and adapted to natural disturbance such as fire on the landscape, fires primarily occur in mid to late summer season, when annual plants have flowered and set seed. Following fall fires, perennial root-stocks remain underground and plants emerge in the spring. Spring and early summer burns could negatively impact emerging vegetation and destroy annual plant seed.		potential habitats for both listed and sensitive plants and no federally listed threatened or endangered plant species were found. Concerted effort was made to conduct surveys during the flowering windows when the likelihood of detection is highest. The impacts/response of sensitive plants to management activities have been discussed in detail in the sensitive plants section of this document. Some sensitive species analyzed could have some long-term benefits from management activities by removing competing overstory cover, and creating potentially suitable disturbance habitats as discussed in further detail in the sensitive plants effects analysis, DEIS p. 125. As discussed in the sensitive plants report and incorporated into the EIS, invasion of exotic species can have long term impacts on sensitive plant species. Invasive exotic plants can make occupied and potential habitats unsuitable for sensitive plant species. The control of weeds through various means can benefit sensitive plants by reducing invasive species from their habitats. However control methods, such as broadcast

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		spraying, can cause short-term harm to sensitive plants if they come into contact with the chemical (USDA Forest Service 2000-Ode). The Beaverhead-Deerlodge Weed Management Plan (2002) protects sensitive plants by employing the following mitigation measure: No herbicide will be applied directly on sensitive plants during spot applications and a 100' buffer will be employed around known populations of sensitive plants during broadcast applications (including aerial). All aerial treatment areas will be surveyed for sensitive plants prior to initial spraying. Weed control activities do occur within the project area, but not within the immediate vicinity of the known sensitive plant populations, as no noxious weeds were currently present. Weed control activities are not known to be posing any impacts to sensitive plants within the project area at this time. Spring burning would occur when soil moisture is high, resulting in little impact if any to the duff layer, let alone the subterranean root structures of potential sensitive

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		plants. As noted in the comment, these plants evolved with fire. Although natural fire may have been more likely to occur during late summer or fall months in the past, spring burning poses even less likely to affect the potential sensitive plant populations and habitat because of the low severity nature of these burn. The impact to annual plant seed is mentioned; however only one sensitive plant analyzed in the Flint Foothills EIS is an annual, Austin's knotweed. Austin's knotweed occurs in sparsely vegetated locations that would not likely carry fire.
What threatened, endangered, rare and sensitive plant species and habitat are located within the proposed project area? What standards will be used to protect threatened, rare, sensitive and culturally important plant species and their habitats from the management actions proposed in this project? Describe the potential direct and indirect effect of the proposed management actions on rare plants and their habitat. Will prescribed burning occur in the spring and early summer; please give justifications for this decision using current scientific studies as reference.	1 and 12	It is Forest Service policy to protect the habitat of federally listed threatened and endangered species (FSM 2670.31), and to avoid or minimize adverse impacts to species designated by the Forest Service as sensitive (FSM 2670.32). The Beaverhead-Deerlodge National Forest is directed by the Forest Plan to maintain and restore sensitive plant populations and their habitat. No federally threatened or endangered plants are known to occur on the Beaverhead-Deerlodge National Forest, nor

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		were found during project surveys. Direct and indirect effects to sensitive plants and their habitat found in the project area are presented in the DEIS, p. 123 Burning would occur when weather and ground conditions are suitable to maintain air quality and burning can be controlled. Ignitions may occur over multiple years. A spring burn period would be preferred to minimize the spread of fire over the ground vegetation, but either a spring or fall burn would be acceptable.
Whitebark Pine Not all ecosystems or all Rocky Mountain landscapes have experienced the impacts of fire exclusion. In some wilderness areas, where in recent decades natural fires have been allowed to burn, there have not been major shifts in vegetation composition and structure (Keane et al. 2002). In some alpine ecosystems, fire was never an important ecological factor. In some upper subalpine ecosystems, fires were important, but their rate of occurrence was too low to have been significantly altered by the relatively short period of fire suppression (Keane et al. 2002). For example, the last 70 to 80 years of fire suppression have not had much influence on subalpine landscapes with fire intervals of 200 to several hundred years (Romme and Despain). Consequently, it is unlikely that fire exclusion has yet to significantly alter stand conditions or forest health within Rocky Mountain subalpine ecosystems. Whitebark pine seedlings, saplings and mature trees, present in subalpine forests proposed for burning, would experience mortality from project activity. Whitebark pine is fire intolerant (thin bark). Fire favors whitebark pine regeneration (through canopy opening and reducing competing vegetation) only in the presence of adequate seed source and dispersal mechanisms (Clarks Nutcracker or humans planting whitebark pine seedlings). White pine blister rust, an introduced disease, has caused rapid mortality of whitebark pine over the last 30 to 60 years. Keane and Arno (1993) reported that 42 percent of whitebark pine in western Montana had died in the previous 20 years with 89 percent of remaining trees being infected with blister rust. The ability of whitebark pine to reproduce naturally is strongly affected by blister rust infection; the rust kills branches in the upper cone bearing crown, effectively ending seed production.	1 and 12	"Not all ecosystems or all Rocky Mountain landscapes have experienced the impacts of fire exclusion *as yet*" (emphasis added; Keane et al. 2002). The natural processes of vegetation succession are reflective of the natural disturbance regime (or fire regime); there are effects to succession as fire suppression has occurred in the past 100 years, however this may not be reflected in an individual stand. Long-term fire intervals in lodgepole pine and spruce-fir subalpine types may not yet be manifested at the stand level, but are detectable at the landscape

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Montana is currently experiencing a mountain pine beetle epidemic. Mountain pine beetle prefer large, older whitebark pine, which are the major cone producers. In some areas the few remaining whitebark that show the potential for blister rust resistance are being attacked and killed by mountain pine beetles, thus accelerating the loss of key mature cone-bearing trees. In the absence of fire, this naturally occurring whitebark pine regeneration would continue to function as an important part of the subalpine ecosystem. Since 2005, rust resistant seed sources have been identified in the Northern Rockies (Mahalovich et al 2006). Due to the severity of blister rust infection within the region, natural whitebark pine regeneration in the project area is prospective rust resistant stock. Although prescribed burning can be useful to reduce areas of high-density subalpine fir and spruce and can create favorable ecological conditions for whitebark pine regeneration and growth, in the absence of sufficient seed source for natural regeneration maintaining the viability and function of whitebark pine would not be achieved through burning. Planting of rust-resistant seedlings would likely not be sufficient to replace whitebark pine lost to fire activities.		level (Keane et al. 2002). Even though late-seral species may differ across a landscape depending on site, the multilayer structures of these late-seral stands are nearly identical across most biophysical settings (Keane et al. 2002). There are measured declines of whitebark pine and young lodgepole pine stands and increases in subalpine fir after 91 years on a fire-excluded Northern Rocky Mountain subalpine landscape (Keane et al. 2002). Blister rust and MPB have accelerated succession to subalpine fir by killing mature whitebark pine, and MPB has killed the majority of lodge pole pine in the project area; this coupled with the lack of fire as a recycling agent has caused a major shift in landscape composition and structure from one of pine to fir and spruce (Keane 2000). Therefore, fire exclusion may not have impacted every single stand within the subalpine forest of mid- to high elevations within the project area, but from a project-wide or landscape perspective, there are changes to the forest that are detrimental to early seral forest species such as whitebark pine. The reference to alpine ecosystems (Keane et al. 2002)

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		refers to above tree-line habitats, which this proposal does not include in treatment alternatives. If fire were to be ignited in whitebark pine stands, whitebark pine trees would experience mortality. This proposal does not include burning in whitebark pine stands, rather focuses on lodgepole dominated forests. However, one unit is known to have whitebark pine; fire ignitions would avoid where whitebark pine occurs in groups or clumps. This would not only provide a means of protection for live mature trees, but established whitebark pine regeneration. There is potential for individual whitebark pine trees to be killed with prescribed burning treatments; however, the resulting canopy openings would be conducive for seeding by Clarks nutcrackers birds. Decline of whitebark pine both regionally and in the project area is occurring. Monitoring conducted for whitebark pine has shown successful natural regeneration of whitebark pine in stands of more pure whitebark pine; where over 200 seedlings per acre were counted (BDNF 2010). In mixed

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		conifer stands, this number dropped to 30 seedlings per acre when the whitebark pine occupies about 1/3 of the trees per acre (BDNF 2010). The prescribed burn design criteria with this proposal would avoid whitebark pine where it occurs in groups, or is more than 20% of the basal area within the stand. Therefore, the created 'favorable ecological conditions for whitebark pine regeneration and growth' would be provided without the fire effects on extensive areas of existing whitebark pine. This action is preferable, regardless of the amount of actual whitebark pine regeneration that is derived over time from the proposed prescribed burning, just to allow the opportunity for a small increase in whitebark presence in the project area.
Are whitebark pine seedlings and saplings present in the subalpine forests proposed for logging?	1 and 12	No whitebark pine has been found through field surveys in any of the proposed harvest (logging) units. Formal surveys will be conducted prior to project implementation.
What surveys have been conducted to determine presence and abundance of whitebark pine regeneration? If whitebark pine seedlings and saplings are present, what measures will be taken to protect them? Will restoration efforts include planting whitebark pine? Will planted seedling be of rust-resistant stock? Is rust resistant stock available? Would enough seedlings be planted to replace whitebark pine lost to fire activities? Have white pine blister rust surveys been accomplished? What is the severity of white pine blister rust in proposed action areas?	1 and 12	Walk-through informal surveys have been conducted in the proposed prescribed burn units, and a mix of walk-through and formal stand exams have been conducted in the proposed harvest units. No whitebark pine has been found in the proposed harvest units. There has been

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		scattered whitebark pine found in the upper elevation (above 7,000 feet elevation) of Unit 5B, a proposed prescribed burn unit, and may occur in other burn units. The proposed implementation criteria are designed to avoid burning activities (including accounting for potential spread) where concentrations of whitebark pine occur. The concentrations of whitebark pine are where stand-scale gap dynamics with mortality of pine trees in clumps have created opportunities for whitebark pine natural regeneration; hence, these are the locations where seedlings and saplings occur. These areas would be avoided with the prescribed burn. However, individual whitebark pine may be affected by prescribed burn activities. No other restoration efforts, including planting of whitebark pine, would occur. No white pine blister rust surveys have been accomplished. White pine blister rust has been observed with walk-through surveys, and is affecting whitebark pine trees in the project area.
It is not clear why the proposed treatments will enhance and protect whitebark pine. Please provide the monitoring and published science that ensures that the proposed treatments will actually promote viability of this species.	3	Neither the purpose and need for the proposed project, DEIS p. 4, nor the design of the proposed treatments Chapter 2 beginning on p. 13, include objectives to

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		enhance or protect whitebark pine. The proposed prescribed fire treatments of mixed conifer stands are the highest priority (GYCC 2011) where a return mixed severity burns of differing intensities create complex patters of tree mortality, providing opportunities for seed caching sites (Keane and Arno 2001). No monitoring of these types of treatments has occurred on the Forest as these treatments have not been conducted. Long-term monitoring plots of whitebark pine have been installed on the Forest, and include an old wildfire area, where in the opening created by fire there is an excess of 400 whitebark pine seedlings per acre (BDNF 2010). Treatment design includes avoiding groups of whitebark pine and target mixed conifer areas to retain whitebark pine.
Old Growth		
Unfortunately, region-wide the FS has failed to meet Forest Plan old-growth standards, does not keep accurate old-growth inventories, and has not monitored population trends in response to management activities as required by Forest Plans and NFMA (Juel, 2003).	1 and 12	The Vegetation section of the DEIS, starting on page 74, provides a summary of old growth estimates in the analysis area. The Clark Fork – Flints Landscape has an estimated 20.9% of the Landscape in an old growth condition, indicating that old growth in the Landscape is not deficient at the regional scale (Bush et al 2006). Additionally, project-specific stand exams were

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		conducted in all of the Douglas-fir – ponderosa pine proposed units, and the amount of old growth discovered is displayed in the Vegetation analysis.
Please disclose how stands to be treated compare to Forest Plan or Regional old-growth criteria. In order to disclose such information, please provide all the details, in plain language, of these areas' forest characteristics (the various tree components' species, age and diameter of the various tree components, canopy closure, snag density by size class, amounts of down logs, understory composition, etc.).	1 and 12	Table 32, p. 90 in volume 1 DEIS in the Vegetation section displays the minimum criteria of each stand within each proposed harvest unit that currently has old growth. The minimum criteria to meet old growth are minimum age of the large trees, minimum number of trees that meet the minimum diameter-at-breast-height (DBH), and the minimum basal area of the stand as a whole (Green et al 2007). There are no minimum criteria for the associated characteristics of DBH variation, percent dead/broken top, probability of downed woody, percent of decay, number of canopy layers and snags (Green et al 2007).
Please define and map all the old growth in the project by each old growth type as per Green et al. 1992*[see literature review].* We would like to know how much old growth and its location is for Douglas-fir old growth. We would like to know where lodgepole pine old growth occurs and its acreage. And we would like to know where spruce old growth currently exists. We would also like to know how much of each of these old growth types are planned for logging in this project.	3	The Forest Plan does not require mapping of all old growth in the project area. The definitions for old growth are from Green et al 2007 errata corrected. Old growth inventories were done through the stand exams conducted for each of the proposed harvest units in the Douglas-fir – ponderosa pine vegetation type. The amount and location of old growth associated with these inventories is displayed in the Vegetation section, table 32

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		p. 90. None of the lodgepole pine proposed salvage units contain old growth, as they all are in a dead and dying status due to MPB. Inventories outside of the proposed harvest or prescribed burn units did not occur, so it is unknown how much lodgepole pine and or spruce old growth occurs in the project area. The project design meets the Forest Plan standard to retain all old growth with all of the proposed treatment activities.
It is important to prevent continued loss of this habitat and promote long-term sustainability of old growth stands, and restore where possible the geographic extent and connectivity of old growth (e.g., using passive and active management-such as avoiding harvest of old growth trees, leaving healthy larger and older seral species trees, thinning and underburning to reduce fuel loads and ladder fuels in old growth while enhancing old growth characteristics).	11	All old growth would be retained with the proposed project, which meets the Forest Plan standard for old growth. Where proposals to treat in old growth (a total of 121 acres in alternative 2), the old growth minimum criteria of old age, number of large trees per acre, and basal area would be retained. The old growth type of late seral, multi-storied stands would be shifted to the old growth type of late seral, single storied stands. Additionally, the proposed treatments extend beyond the old growth stands into adjacent Douglas-fir – ponderosa pine mature stands; these treatments would accelerate the time the mature stands become old growth, which would extend the geographic extent and improve connectivity of old growth.

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It would be helpful to define old growth for the project area (e.g., specify large tree age, trees/acres greater than certain DBH, etc).	11	Old growth is defined by Green et al 2007, and is displayed by stand in the Vegetation section of the DEIS p. 90, Table 32.
We note that lands outside the forest boundary have often not been managed for the late-seral or old growth component, so National Forest lands may need to contribute more to the late-seral component to compensate for the loss of this component on other land ownerships within an ecoregion.	11	Land management strategies outside of the project area boundary are outside the scope of this project. However, the project area is dominated by mature and old stands (23,410 acres of mid to late seral out of 44,522 acres total project area; see Vegetation analysis). Mountain pine beetle has affected the 8,556 acres of mid to late seral pine stands, and this proposal would thin additional Douglas-fir – ponderosa pine stands, but with retention of the largest and oldest trees.
We would like to address one of the preliminary issues/concerns identified in the document. That is the maintenance of old growth stand characteristics where encountered. Both Mountain pine beetle and Douglas Fir bark beetle predominantly target mature trees. In other words, old growth. Continued overstocking of forest resources only adds to moisture stress experienced by mature trees. The proposed action will do exactly the opposite of threatening old growth. Continued overstocking and failure to actively manage forest resources provides a greater threat to old growth than responsible removal of dead and dying trees.	5	Thank you for your comment. The purpose of the proposed commercial thinning of Douglas-fir – ponderosa pine stands is to reduce stand densities for the growth and yield of sawtimber, crop trees, pulpwood, and other forest products, and use forest products to provide economic benefits where project objectives, forest plan objectives, and forest plan standards can be met.
Please provide a thorough inventory of old growth as per Region l criteria in Green et al. 1992. We would like to see a breakdown of each old growth type, and how many of these stands were field verified. We don't consider using a stand exam or satellite mapping as" verified." In either case, please demonstrate the reliability of the old growth analysis.	13	A thorough inventory of old growth was completed of each proposed treatment unit, and is displayed in the Vegetation section of the DEIS pp. X. This includes a breakdown of each old

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		growth type found, and in which unit old growth occurs. Satellite imagery was not used to determine or 'verify' old growth. However, stand exams were used, and are the highest standard with which to determine old growth; stand exams are an unbiased, systematic, on-the-ground evaluation of a stand, and are conducted to Regional statistical standards. These exams were conducted where old growth was likely to occur. The remaining units were field reviewed by a certified silviculturist. Both the results of the stand exams and the compilation of field notes are a part of appendix E of the DEIS.
There is currently no old growth management strategy for the Forest. Until this Forest Plan flaw is corrected, there should be no logging on the Forest.	13	The Forest Plan has old growth goals, objectives and standards in the Vegetation section provide the management strategy for the BDNF (see Forest Plan pages 43-44).
Vegetation – Ecosystems/Habitats/Fire Cycles		
Ecosystems		
Proposed activities could artificialize the forest ecosystem. Lodgepole pine is particularly subject to blowdown, once thinned. And any forest condition that is maintained through mechanical manipulation is not maintaining ecosystem function The proposed management activities would not be integrated well with the processes that naturally shaped the ecosystem and resulted in a range of natural structural conditions. Thus, [there is a] need for standards guiding both the delineation of zones where artificializing fuel reduction actions may take place, and that also set snag and down woody debris retention amounts.	1 and 12	Lodgepole pine has 70% mortality and is mostly dead in units. We are targeting commercial thin treatments to Douglas-fir and some blowdown may occur in lodgepole pine We are leaving snags in clusters to create more stabilization to

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		keep more snags standing. The project will follow all standards in the Forest Plan
Veblen (2003) questions the premises the FS often puts forth to justify “uncharacteristic vegetation patterns” discussions, that being to take management activities to alter vegetation patterns in response to fire suppression: The premise behind many projects aimed at wildfire hazard reduction and ecological restoration in forests of the western United States is the idea that unnatural fuel buildup has resulted from suppression of formerly frequent fires. This premise and its implications need to be critically evaluated by conducting area-specific research in the forest ecosystems targeted for fuels or ecological restoration projects. Fire regime researchers need to acknowledge the limitations of fire history methodology and avoid over-reliance on summary fire statistics such as mean fire interval and rotation period. While fire regime research is vitally important for informing decisions in the areas of wildfire hazard mitigation and ecological restoration, there is much need for improving the way researchers communicate their results to managers and the way managers use this information.	1 and 12	The purpose and need for this project does not include wildfire hazard reduction or ecological restoration, DEIS p.4. Additionally, there is not a proposal to reduce an unnatural fuel buildup resulting from suppression, nor is there a statement in the analysis that says there is an unnatural fuel buildup resulting from suppression.
The FS has acknowledged that viability is not merely a project area consideration, that the scale of analysis must be broader: Population viability analysis is not plausible or logical at the project level such as the scale of the Dry Fork Vegetation and Recreation Restoration EA. Distributions of common wildlife species as well as species at risk encompass much larger areas than typical project areas and in most cases larger than National Forest boundaries. No wildlife species that presently occupy the project area are at such low numbers that potential effects to individuals would jeopardize species viability. No actions proposed under the preferred alternative would conceivably lead to loss of population viability. (Lewis and Clark NF, Dry Fork EA Appendix D at p. 9.)	1 and 12	The commenter is referring to a separate project on a different National Forest. For the BDNF, species viability was analyzed at the Forest-scale for the Forest Plan (Forest Plan FEIS, Revised Appendix B). Viability for species requiring a larger analysis area (e.g. black-backed woodpecker and flammulated owl) was analyzed at the regional level by Samson (2006) and tiered to in the Forest Plan FEIS.
The FS should firmly establish that the species that exist, or historically are believed to have been present in the analysis area are still part of viable populations. Since Forest Plan monitoring efforts have failed in this regard, it must be a priority for project analyses. Identification of viable populations is something that must be done at a specific geographic scale. The analysis must cover a large enough area to include a cumulative effects analysis area that would include truly viable populations. Analysis must identify viable populations of MIS, TES, at-risk, focal, and demand species of which the individuals in the analysis area are members in	1 and 12	It is too early to speculate that Forest Plan monitoring has failed, since the Forest Plan has only been in place since 2009. See previous response regarding viability analysis.

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order to sustain viable populations		
		The Sensitive Plant, Wildlife and Aquatics sections of the DEIS, pp. 113, 143 and 297, identify and disclose effects to TES in the project area. The Wildlife and Aquatic sections address MIS.
Habitats		
Since the Beaverhead-Deerlodge National Forest (BDNF) does not have a management indicator species (MIS) for **forest interior habitat**, it is not clear how viability of this suite of species will be provided for in the project area. There are currently no management standards in the Forest Plan for these many species. This project cannot meet the requirements of either the NEPA or the National Forest Management Act (NFMA) without conservation strategies for these species when their habitat will be degraded/removed with logging.	3	Specific species were not identified as associated with forest interior habitat. The Forest Plan assumes that maintaining historic patterns and size class structure will maintain habitats for species that evolved and are adapted to these local habitat conditions.
We are concerned about the lack of an MIS for old growth habitat. How can the agency ensure the viability of this suite of species, or those many species benefited by old growth, without an MIS? How can the agency measure management impacts on old growth habitat condition and recruitment without monitoring an MIS?	3	MIS are selected at the Planning Area scale. The Forest Planning record includes documentation of the rationale for selection of MIS. The Forest Plan FEIS (pg. 689) states that the plan has not identified a wildlife old growth MIS in preference to monitoring old growth using Forest Inventory and Analysis (FIA).
Fire Cycles		
Since disruption of fire cycles is identified, the BDNF needs to take a hard look at its fire policies. The development of approved fire management plans in compliance with the Federal Wildland Fire Policy was the number one policy objective intended for immediate implementation in the Implementation Action Plan Report for the Federal Wildland Fire Management Policy and Program Review. In general,the FS lags far behind other federal land management agencies that have already invested considerable amounts of time, money, and resources to implement the Fire Policy. Continued mismanagement of national forest lands and FS refusal to fully implement the Fire Policy puts wildland firefighters at risk if and when they are dispatched to wildfires. This is a programmatic issue, one	1 and 12	The purpose and need for the Flint Foothills project, DEIS p.4, does not include addressing BDNF fire policies. Fire management is addressed on p. 22 of the Forest Plan.

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that the current Forest Plan does not adequately consider. Please see Ament (1997) as comments on this proposal, in terms of fire policy and Forest Planning.		
Fire/Fuels/Air Quality		
Fire and Fuels		
WUI that's relevant to this area must be displayed on a map. More importantly, the fuel/fire hazard situation post-project on land of all ownerships within the WUI must also be displayed on a map. Based on this mapping of current and projected conditions, please accurately disclose the threats to private structures and people under those scenarios, for all alternatives. It must be discernable why some areas are included for treatment and others are not. The FS must have a detailed long-term program for maintaining the allegedly safer conditions, including how areas will be treated in the future following proposed treatments, or how areas not needing treatment now will be treated as the need arises. The public at large and private landowners must know what the scale of the long-term efforts must be, including the amount of funding necessary, and the likelihood based on realistic funding scenarios for such a program to be adequately and timely funded. The FS must assess the fuel and fire risk situation across land ownership boundaries to understand, and disclose to the public, the likely fire scenarios across the area's landscape. Only then can the context of your proposal be adequately weighed on its merits and evaluated on its merits.	1 and 12	There is no identified WUI from the County Wildfire Protection Plan within the project area. The purpose and need for the project, DEIS p.4, does not include addressing fuel and fire risk.
The FS (Cohen, 1999) reviewed current scientific evidence and policy directives on the issue of fire in the wildland/urban interface and recommended an alternative focus on structure ignitability rather than extensive wildland fuel management: The congruence of research findings from different analytical methods suggests that home ignitability is the principal cause of home losses during wildland fires… Home ignitability also dictates that effective mitigating actions focus on the home and its immediate surroundings rather than on extensive wildland fuel management. [Research shows] that effective fuel modification for reducing potential WUI fire losses need only occur within a few tens of meters from a home, not hundreds of meters or more from a home. This research indicates that home losses can be effectively reduced by focusing mitigation efforts on the structure and its immediate surroundings. Those characteristics of a structure's materials and design and the surrounding flammables that determine the potential for a home to ignite during wildland fires (or any fires outside the home) will, hereafter, be referred to as home ignitability. The evidence suggests that wildland fuel reduction for reducing home losses may be inefficient and ineffective. Inefficient because wildland fuel reduction for several hundred meters or more around homes is greater than necessary for reducing ignitions from flames. Ineffective because it does not sufficiently reduce firebrand ignitions (Cohen, 1999) That research also recognizes "the imperative to separate the problem of the wildland fire threat to homes from the problem of ecosystem sustainability due to changes in wildland fuels" (Ibid).	1 and 12	The purpose and need for the Flint Foothills project, DEIS p.4, does not include a reduction in the risk of wildfire to reduce the treat to homes, or relate ignition probability of structures within a defined wildland-urban interface (WUI). The project area is not within a WUI. The Cohen, 1999 citation references the flammability of structures within a defined urban interface, and defines who should be responsible for fuels treatment within WUI and the effectiveness of said treatments in reducing wildfire risk and spread. This paper discusses how wildland

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		vegetation management could not necessarily protect a home from fire, and homeowners are ultimately responsible for protecting their homes from fire. Cohen states, "home ignitability, i.e., the potential for a home fire loss, is the homeowner's choice and responsibility." This paper does not state that vegetation management is not needed; in fact it discusses the need for management to enhance the ability to control fires in WUIs. This quotation has been taken out of context.
Please consider that thinning can result in faster fire spread than in the unthinned stand. Graham, et al.1999a. Graham, etal., 1999a point out that fire modeling indicates: For example, the 20-foot wind speed1 must exceed 50 miles per hour for midflame wind speeds to reach 5 miles per hour within a dense Stand (0.1 adjustment factor). In contrast, in an open stand (0.3 adjustment factor), the same midflame wind speeds would occur at only a 16-mile-per-hour wind at 20 feet. Graham, et al., 1999a also state: Depending on the type, intensity, and extent of thinning, or other treatment applied, fire behavior can be improved (less severe and intense) or exacerbated." … Fire intensity in thinned stands is greatly reduced if thinning is accompanied by reducing the surface fuels created by the cuttings. Fire has been successfully used to treat fuels and decrease the effects of wildfires especially in climax ponderosa pine forests (Deeming 1990; Wagel and Eakle 1979; Weaver 1955, 1957). In contrast, extensive amounts of untreated logging slash contributed to the devastating fires during the late 1800s and early 1900s in the inland and Pacific Northwest forests. In their conclusion, Graham, et al., 1999a state: Depending on intensity, thinning from below and possibly free thinning can most effectively alter fire behavior by reducing crown bulk density, increasing crown base height, and changing species composition to lighter crowned and fire-adapted species. Such intermediate treatments can reduce the severity and intensity of wildfires for a given set of physical and weather variables. But crown and selection thinnings would not reduce crown fire potential. Also, Hessburg and Lemkuhl (1999) suggest that prescribed burning alone can be utilized in many cases—possibly here—where managers typically assume mechanical fuel reductions must be used. Since the scientific literature suggests that thinning activities will actually increase the rate of fire spread, you need to	1 and 12	While the purpose and need for the Flint Foothills project, DEIS, p.4, does not include fuel or fire risk reduction, and neither scoping letter addressed rate of spread, Graham et. al. is addressed with respect to rate of spread: The type of thinning done does make a difference (can influence) to fire behavior. Depending on intensity, thinning from below and possibly free thinning can most effectively alter fire behavior by reducing crown bulk density, increasing crown base height, and changing species composition to lighter crowned and fire-adapted species (Graham et al. 1999). The type of thinning prescribed with the project is thinning from below and free thinning. The paper goes

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reconcile such findings with the contradictory assumptions expressed in your scoping letter.		on to say that 'crown and selection thinning' would not reduce crown fire potential (Graham et al 1999); the proposal does not prescribe crown and selection thinning. Additionally, surface fuels created by treatments can increase intensity of surface wildfires (Graham et al. 1999); post-harvest prescribed burning is planned in the proposed units in addition to whole tree yarding of the non-merchantable material. Neither of the Flint Foothills scoping letters addressed rate of spread.
Any desire to keep a road in the project area WUI must be in harmony with the alleged priority goals (again, to reduce the chances that fire will destroy private structures and harm people), not driven by timber production goals. The analysis must show how all roads will in fact be in harmony with the priority goals.	1 and 12	The Flint Foothills project area is not in an identified wildland urban interface (WUI) area and has no priority goals to reduce the chances that fire will destroy private homes and harm people. The purpose and need for the Flint Foothills project, DEIS p.4, does not include fuel or fire risk reduction. Any road-related decisions are based on resource conditions.
I am concerned about the large amount of acreage that is being proposed to bum in this proposal. Many of the acres appear to be in heavily timbered areas and I question the ability to control fire in these areas. At the very least I would like to request that the salvage harvest and commercial thinning treatments be completed before you set fire to the countryside.	2	Ignition of the proposed prescribed burn units would be done when these treatments can be controlled, and would occur after the commercial harvest activities are completed.
Forest Service Responsible Officials Must Never take Action to Modify or Reduce Fire Severity because the	4	Thank you for your comment. The

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Natural Resources in the Forest Benefit from Fire.		purpose and need for the Flint Foothills project, DEIS, p.4, does not include the need to modify or reduce fire severity. Fire is being used as a tool to meet objectives for natural resources that benefit from fire. There are many situations, however, where the Forest Service might want to take action to modify or reduce fire severity and behavior where there is an identified value at risk to be protected.
Commercial timber sales intended to remove fuels (in order to slow the rate of fire spread and fire intensity) should not be prepared and implemented *(see Opposing Science Attachment #1 in literature review).*	4	The purpose and need for the Flint Foothills project DEIS, p.x does not include fuel reduction to slow the rate of fire spread and fire intensity. References included in the Opposing Science Attachment are addressed in the Literature Review section, table B-3 in this section.
Another issue we would like to address is the increased safety to Granite County citizens provided by the proposed action. Catastrophic wildfire is great concern for many in Granite County, and particularly for those living in rural portions of the County. We cannot stress enough our support for responsible removal of potential fuel for catastrophic fire concerns. We understand the argument that initially fire danger is high while the trees are "red" and is reduced until the trees fall to the forest floor when it raises again…	5	We appreciate the commenters concern for the safety of Granite County citizens related to catastrophic fire. The purpose and need for the Flint Foothills project, DEIS p. 4, does not include removal of fuels to mitigate catastrophic fire. In the future, if the Forest Service proposed removing fuels for the mitigation of catastrophic fire, those effects would be analyzed. No such proposals have been identified.
Ban fire. As for setting fires, burning vegetation releases mercury into the air. it also releases fine particulate matter which is microscopic and is not smoke. such fine particualte matter enters the human body and	8	Thank you for your comment.

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causes lung cancer, heart attacks, strokes,. pneumonia, allergies and asthma. nobody needs that.		
We are supportive of efforts to reduce hazardous fuels and fire risks and reduce wildfire intensity in Wildland Urban Interface (WUI) areas near homes and structures where there is high fire risk. The risks of uncharacteristic disturbances such as catastrophic wildfire should be evaluated versus the effects of active restoration designed to reduce those risks (i.e., water quality, fisheries and wildlife effects).	11 11	Thank you for your comment. The purpose and need for the Flint Foothills project DEIS, p. x does not include fuel or catastrophic fire risk reduction. Hence, the risk of uncharacteristic disturbances such as a wildfire is not evaluated.
Fire management does not require logging of entire landscapes to protect the public from fire. Fire buffers are sufficient.	13	Thank you for your comment**.**
Air Quality		
We recommend that the EIS discuss the *Interim Air Quality Policy on Wildland and Prescribed Fires,* and disclose how the Federal Land Manager is participating in a certified Smoke Management Program (e.g., Montana/Idaho State Airshed Group), and describe how prescribed burns will be in line with the State certified Smoke Management Program.	11	The Air Quality section of the DEIS, p. 104 addresses the *Interim Air Quality Policy on Wildland and Prescribed Fires.* The EPA (1998) issued this policy to balance the use of managed wildland fires and prescribed fires with protection of public health and welfare. It has two public policy goals: (1) to allow fire to function in its natural role in maintaining healthy wildland ecosystems, and (2) to protect public health and welfare by mitigating the impacts of air pollutant emissions on air quality and visibility. It identifies responsibilities of wildland owners/managers and state/tribal air quality managers to coordinate fire activities, minimize air pollutant emissions, manage

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		smoke from wildland and prescribed fires managed for resource benefits, consider alternative land treatments, and establish emergency action programs to mitigate the unavoidable impacts on the public. The Airshed Monitoring portion of the report describes how Federal Land Managers participate in a certified Smoke Management Program (e.g., Montana/Idaho State Airshed Group), and it describe how prescribed burns will be in line with the State certified Smoke Management Program Each airshed has an Airshed Coordinator who acts as the point of contact for the Airshed Group members operating within that airshed. Airshed members submit a list of planned burns to the SMU describing the type of burn to be conducted, the number of acres, as well as the location and elevation at each site. Burns are reported by "airshed," geographical areas with similar topography and weather patterns. The SMU and the Montana and Idaho Departments of Environmental Quality interact on the daily decisions that can restrict burning. Restrictions may be by airshed, elevation, or by

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		special impact zones around populated areas and are based on current and predicted smoke dispersion. The Flint Foothills project area is located on the northern edge of Montana Airshed 5 (Upper Clark Fork) and adjacent to the southern edge of Montana Airshed 3B.
Wildlife		
The FS must disclose its transparent, well thought-out long-term strategy for old-growth associated wildlife species viability in a properly defined cumulative effects analysis area.	1 and 12	The Wildlife section in the DEIS, p. 143. includes a discussion of old growth within the analysis area for each individual species and habitat. Forest Plan Vegetation Goal is to manage for old growth on a forest-wide basis and for old growth to be well-distributed across the Forest. The vegetation standard for old growth would result in no net loss of old growth structural characteristics in those areas entered for vegetation treatment. During development of the 2009 Forest Plan, species/habitat relationships were considered; analysis indicates there are no old-growth obligate wildlife species associated with old-growth types that occur on the Forest. Old growth habitat structural characteristics will be maintained at the project and planning area level.
Please demonstrate that this project will leave enough snags to follow the Forest Plan requirements and the requirements of sensitive old growth species such as flammulated owls and goshawks. Loggers are required	1 and 12	Management implications for snag resources and snag-

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to follow OSHA safety standards. Will these standards require snags to be cut down? After snags are cut down for safety for OSHA requirements will there still be enough snags left for old growth sensitive species?		dependent species are discussed in the Wildlife section of the DEIS, p. 145 and 156. Project design features and mitigation measures, starting on p.43 of the DEIS. require retaining adequate snag numbers to meet Forest Plan standards. In addition, design criteria require retaining snags in clumps to reduce the potential for windthrow and removal for safety reasons.
Specifically how will the Stonewall [Flint Foothills] Project affect Flammulated owls, cavity-nesters usually associated with mature stands of ponderosa pine and Douglas-fir?	1 and 12	The commenter is referring to a project on another Forest. The Wildlife section of the Flint Foothills DEIS, p.178 addresses the effects of proposed treatments on flammulated owl habitat.
Among other habitat characteristics, flammulated owls benefit from an abundance of large snags and a relatively dense under-story. The flammulated owl is a sensitive species in Region One, and is largely dependent on old ponderosa pine forests. According to a 2002 Region-wide assessment, not referenced in the 2003 FEIS for the Project, such forests only occur at 12-16% of their former, pre-fire suppression/pre-logging (that is, “historic”) levels, and thus species viability has been determined to be at risk. The Northern Region also recognizes that its strategy for restoring habitat for the flammulated owl and found in the Island South project that “in no way guarantees that flammulated owls will be restored to viable levels." Snag densities recommended by experts to support cavity-nesting birds range from 2.1 to 11 snags per acre of greater than 9” dbh. Please note that the fact that more recent science has called into question the lower snag densities cited in the earlier research, and the more recent science implies that about 4 snags per acre may be the minimum required to insure viability.	1 and 12	The commenter is referencing another project (“2003 FEIS for the Project”). The Wildlife section of Flint Foothills DEIS, p. 178 addresses the effects of proposed treatments on flammulated owl habitat. Treatments proposed under the Flint Foothills project would meet Forest Plan snag retention standards that require retaining from 3.6 to 8 snags > 15” d.b.h. per acre depending upon the vegetation category(table 46).
What surveys has the HNF [B-D] specifically designed to detect flammulated owls?	1 and 12	Surveys for flammulated owl presence were conducted in the project area during 2010 and 2011. The survey summary is provided in appendix F of the

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		DEIS.
The FS has not developed a conservation strategy for the flammulated owl in the BDNF, or in the Northern Rockies. Absent an appropriate landscape management strategy for insuring their viability, based upon the best available science, it is arbitrary and capricious to dismiss potential impacts on the ground where the FS has failed to conduct the kind of comprehensive surveys that would reveal their presence. This convenient excuse for not protecting for a species that is becoming exceedingly rare, a strategy of managing for extinction (since protection premised on detection affords greatest protection to the species that least need it) has been condemned by the FS's own leading expert in the northern region, Mike Hillis: With the exception of the Spotted Owl…, the U.S. Forest Service has not given much emphasis to owl management. This is contrary to the National Forest Management Act of 1976 (NFMA) which mandates that all wildlife species be managed for viable populations. However, with over 500 vertebrate species this would be difficult for any organization. Recognizing the absence of detailed information on owl habitat, the apparent association of owls with snags, mature, and old-growth timber (both rapidly declining), it seems inconsistent that the U.S. Forest Service has placed little emphasis on owl management. One might conclude that the agency's painful experiences with the Spotted Owl in Oregon and Washington have evolved into a 'hear no evil; see no evil' approach for other forest owls as well. Holt and Hillis, "Current Status and Habitat Associations of Forest Owls in Western Montana" (1987). State-of-the-art conservation biology and the principles that underlie the agency's policy of "ecosystem management" dictate an increasing focus on the landscape-scale concept and design of large biological reserves accompanied by buffer zones and habitat connectors as the most effective(and perhaps only) way to preserve wildlife diversity and viability (Noss, 1993). The FS has stated: "Well distributed habitat is the amount and location of required habitat which assure that individuals from demes,2 distributed throughout the population's existing range, can interact. Habitat should be located so that genetic exchange among all demes is possible." (Mealey 1983.)	1 and 12	Forest Plan FEIS (pg. 688) states that the "Conservation Assessment of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, and Pileated Woodpecker in the Northern Region (Samson 2006) provides guidance for managing and assessing effects to flammulated owls. That assessment is supplemented by "Habitat Estimates for Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten, and Fisher (Samson 2006).
Please examine how this project could affect grizzly bears, lynx and other species listed under the Endangered Species Act. Are you complying with lynx critical habitat requirements? Please examine how this project will affect all MIS and sensitive species.	1 and 12	Potential impacts to Threatened, Endangered, Candidate, Sensitive and MIS species and habitat are evaluated in the wildlife report and summarized in the Wildlife section of the DEIS p. 207
For the proposal to be consistent with the Forest Plan, enough habitat for viable populations of old growth dependent wildlife species is needed over the landscape. Considering potential difficulties of using population viability analysis at the project analysis area level (Ruggiero, et. al., 1994), the cumulative effects of carrying out multiple projects simultaneously across the BDNF makes it imperative that population viability be assessed at least at the forestwide scale (Marcot and Murphy, 1992). Also, temporal considerations of the impacts on wildlife population viability from implementing something with such long duration as a Forest Plan must be considered (id.) but this has never been done by the BDNF. It is also of paramount importance to	1 and 12	Species/habitat relationships were considered and species viability at the Forest scale was addressed in development of the 2009 Forest Plan.

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monitor population during the implementation of the Forest Plan in order to validate assumptions used about long-term species persistence i.e., population viability (Marcot and Murphy, 1992; Lacy and Clark, 1993). The U.S. District Court in Montana recently ruled in Native Ecosystems Council vs. Kimbell on the Keystone Quartz project that the Forest Service presented no hard data to support or demonstrate the biological impact on old-growth species viability across the forest of further reducing Douglas fir old-growth habitat below minimum forest plan standards, which themselves may be inadequate in light of more recent scientific information. Species in the Northern Region, including the BDNF, thought to prefer old-growth habitat for breeding or feeding include northern goshawk, flammulated owl, pileated woodpecker, black-backed woodpecker (after wildfire or beetle epidemic), fisher, marten, Canada lynx, and wolverine. For the BDNF, sensitive old-growth dependent species include the northern goshawk and flammulated owl. According to official FS policy, the BDNF "must develop conservation strategies for those sensitive species whose continued existence may be negatively affected by the forest plan or a proposed project." FSM 2670.45. These strategies would address the forest-wide and rangewide conditions for the affected species, allowing site-specific viability analysis to be tiered to the forest-wide viability analysis, and would establish quantifiable objectives for the affected species. These strategies must be adopted prior to implementation of projects that would adversely impact sensitive species habitat. FSM 2622.01, 2670.45.		In addition, the Forest Plan FEIS (pg. 688) states that the "Conservation Assessment of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, and Pileated Woodpecker in the Northern Region (Samson 2006) provides guidance for managing and assessing effects to flammulated owls. That assessment is supplemented by "Habitat Estimates for Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten, and Fisher (Samson 2006), Treatments proposed under this project would not result in a reduction of old growth forest acres, Vegetation section of the DEIS, starting on page 88.
We are concerned about the status of the goshawk on the BDNF. Please define the current and proposed status of this species by the current best science as per the Southwest goshawk guidelines. We would like to know the habitat conditions for this species by each of the 6 structural stages outlined in those guidelines, since the Region 1 goshawk habitat criteria are too general to adequately define goshawk habitat.	3	The Northern Goshawk Northern Region Overview (2009) states that VSS diameter classes described in the "Management Recommendations for the Northern Goshawk in the Southwestern United States" (Reynolds et al. 1992) are not readily comparable to the diameter classes present in Region 1, and that it was necessary to combine VSS classes 4, 5, and 6 (Reynolds et al. 1992) into one size class (>

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		10” d.b.h.) to compare and reflect mature and older forest in Region 1.
Please define how the project will affect populations of two key prey species for various predators. These prey species include the red squirrel and snowshoe hare. Please define how these prey species will be managed and their viability ensured in the project area over time.	3	The DEIS discusses winter snowshoe hare habitat within the project area, Wildlife section, pp. 229-231. While other species prey on snowshoe hares, the analysis is based on Forest Service Northern Region Lynx Standards and Guidelines. Both snowshoe hare and red squirrels are addressed as goshawk prey species (Wildlife section, DEIS, p. X)
How will the management impacts on snag-associated wildlife, which includes about 25% of the forest bird fauna, be monitored? If a snag proxy will be used to estimate population effects, please define how the validity of this proxy has been determined to ensure its effectiveness.	3	Snag numbers would be monitored as one component measured to determine current condition and trend for key vegetation characteristics of vegetation diversity at the Forest level. Forest Plan monitoring for snags is done at 5-year intervals using FIA (or other) data to monitor snags Forest-wide. (Refer to Chapter 5 of the Forest Plan.
We are concerned about the lack of snags and snag recruitment within clearcuts. This is basically a permanent removal of habitat for snag-associated wildlife. Please define how these "black holes" for snags affect associated species across this landscape.	3	Snag numbers would be retained according to Forest Plan snag standards. All treatments would retain all live trees greater than 20” d.b.h. Additional green trees would be retained for future snag recruitment according to Forest Plan standards, DEIS, p. 95, 156, and appendix E.

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What is the expected snag recruitment within commercial thin units? How much will snag habitat and size be reduced over the long term due to thinning, and how much will snag-associated species be reduced as a result?	3	Snag recruitment through time after commercial thinning has not been modeled. The vegetation analysis in the DEIS, p. 95 states that post-treatment stand structure in commercially thinned stands would be similar to what would have been created in the 20-year interval fire disturbance regime historically.
How much of the landscape can have reduced snag habitat before significant reductions in associated species occur? What level of this loss of habitat currently exists, and what is the estimated "threshold level" of non-habitat before snag-associated wildlife populations experience significant losses of population levels in the affected landscape?	3	Potential black-backed woodpecker habitat from the Northern Region viability model is estimated at 395,316 acres for the BDNF as of 2008 (Bush and Lundberg 2008). Samson (2006) showed that 29,405 acres constitutes minimum viability threshold for the Northern Region as a whole. Minimum viable threshold identified for flammulated owls for the Northern Region is approximately 4,700 acres (Samson 2006). Habitat modeling shows that the Northern Region contains 184,952 acres of suitable flammulated owl habitat, of which 7,321 acres occur on the BDNF (Bush and Lundberg 2008).
How is the availability of larger snags on the BDNF affecting snag-associated wildlife at this time?	3	Large snags are well-distributed on the BDNF with lower numbers noted in the Upper Clark Fork landscape (Forest Plan FEIS, pgs. 495-496). Snags equal to or greater than 10” d.b.h. average

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		4.3 per acre in the Clark Fork-Flints landscape.
What level of wildlife surveys will be done for the goshawk, pileated woodpecker, great gray owl and flammulated owl to ensure that all currently occupied suitable nesting habitat for these species is identified and protected in this project?	3	Surveys were conducted in priority areas associated with proposed treatments for flammulated owl, black-backed woodpecker, and great gray owls. Historic nest surveys were conducted for goshawks DEIS appendix F, and the Wildlife Report, appendix B, in the project file. Pileated woodpeckers are not a sensitive species on the BDNF; no surveys were conducted for this species.
Please define what the conservation strategies will be for the pileated woodpecker, and how this compares to the current best science for this species as per published literature.	3	The 2009 Forest Plan developed objectives for managing wildlife habitat and determined that implementation of the Plan would not reduce viability for wildlife species. The pileated woodpecker is not an R1 sensitive species and is not identified as having a viability concern in the Region. The conservation assessment completed by Samson (2006) determined that short-term viability for pileated woodpeckers is not an issue in the Northern Region.
Please define the conservation strategies for various species of concern, including songbirds, in the project area, and how population declines will be avoided as a result of this project. What conservation practices will be implemented to meet the Memorandum of Understanding for migratory bird species?	3 3	Forest Plan wildlife objectives tier to management plans, conservation strategies, and conservation assessments as information sources to consider

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		when designing projects that may affect sensitive or federally listed species. Migratory birds are addressed in the Wildlife section of the DEIS, p. 231. The analysis addresses effects to species identified by USFWS as Birds of Conservation Concern (BOCC) and project effects in relation to elements contained in the USFWS-FS migratory bird MOU.
How will forest thinning as well as clearcutting affect habitat for wildlife species that require large amounts of coarse woody debris, such as the pine marten and red-backed vole. What is the specific habitat management direction for these two species that will ensure viability within the project area?	3	American marten and red-backed vole are not federally listed species and are not species identified in the Northern Region as having a viability concern (i.e. sensitive species). Project activities would conform to Forest Plan standards for retaining large woody debris.
Please define elk security by the COMPLETE Hillis definition before and after logging.	3	The Wildlife section in of DEIS, p.212 discloses the effects to elk secure areas (hunting season) using Forest Plan direction that was based on management recommendations from Christensen et al. (1993), Wisdom (2004) and the Yellowstone Grizzly Bear Amendment (USDA Forest Service 2006) for the same reasons disclosed in the Forest Plan FEIS (pp. 488-489, 513-517, 684-685 and 697). Christensen et al. (1993) considered Hillis et al. during development of their recommendations and considerations.

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		Also see Rohrbacher 2011 in appendix F of the DEIS for more analysis of other science and rationale for selection of secure areas (as measured by OMRTD) as the preferred analysis method.
Please define habitat effectiveness for elk before and during logging.	3	The Wildlife section of the DEIS, p. 212, addresses wildlife security habitat and Open Motorized Road and Trail Densities (OMRTDs) before, during, and after implementation.
Please map big game winter range, calving grounds, and fall security areas in the project area.	3	Elk winter range and fall secure areas are mapped in the Wildlife section of the DEIS, figure 35, p. 210. Elk calving grounds are not mapped, but are addressed in the wildlife analysis.
The BDNF does not provide for management of lynx habitat as per the Forest Plan Amendment. However, since this is historic lynx habitat, the direction in the Northern Lynx Management Direction Amendment should be applied, including to areas planned for precommercial thinning.	3	Current direction for unoccupied forests is to consider lynx direction using the Northern Region Lynx Direction table with standards and guidelines. This has been done, as shown in the Wildlife section of the DEIS, pp. 223 and in appendix F of the DEIS. Vegetation standard S5 applies to precommercial thinning and generally restricts precommercial thinning that reduces winter snowshoe habitat (with a few listed exceptions).
New mapping of lynx habitat may be required in the future on the BDNF, to ensure that habitat conditions remain suitable for lynx on these lands in the future. The project area could be fall under the management constraints in the future, so that this project should not go forward until this issue is resolved.	3	The status and scheduling of future mapping of lynx habitat on the BDNF is unknown. The Flint Foothills wildlife analysis utilized

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		the most current lynx habitat model.
Please define where the movement corridors are going to be maintained for migration of grizzly bears along this landscape.	3	The Forest Plan contains goals and objectives pertaining to wildlife movement and linkages via maintaining and consolidating FS ownership at highway and road crossings, and providing secure habitat. Summer and fall season secure habitat as well as OMRTD goals and objectives are identified in the Forest Plan and addressed in the Wildlife section of the DEIS, pp. 158-170.
Please evaluate the impact of large openings on wildlife, including snag-associated wildlife and forest interior species.	3	The Wildlife section of the DEIS, p. 176, addresses effects of large openings for black-backed woodpecker, great gray owl, and migratory birds (i.e. olive-sided flycatcher).
The information in the scoping package indicates that timber harvest will occur on 2,322 acres and 2,230 acres will be burned. Most birds nest in the brush, trees, or on the ground. Harvesting timber and/or burning brush where birds nest is guaranteed to kill individual birds and/or destroy their nesting habitat. There are 836 species of birds protected under the Migratory Bird Treaty Act. See 50 CFR 10.13 for a complete listing. Also see: http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtandx.html Many birds protected under the Migratory Bird Treaty Act of 1918 exist in the forests of North America. Using the link to the bird species protected under the Migratory Bird Treaty Act *(see link in literature review)* please indicate in the EA the bird species that exist in the project area or have habitat in the project area. If there are no protected bird species that exist in the project area or have habitat in the project area, please indicate this in the final EA.	4	The Wildlife section in the DEIS, p. 170 and 231 addresses direct and indirect effects to a number of bird species that may occur within the project area, including sensitive species as well as migratory birds identified by USFWS as Birds of Conservation Concern.
There are countless natural resources in a forest besides merchantable-sized conifers. Trees burn in wildfires. This has been happening for thousands of years. We still have mature forests and properly functioning natural resources in those forests given the fact that each acre of forest has burned several of times in the past. The natural resources in the national forests will be rejuvenated by wildfire. Some species of mammals and birds depend on wildfire which creates unique habitat unavailable at any other time. These	4	Thank you for your comment. The DEIS acknowledges the role of fire in shaping vegetation structure and composition on the landscape, Vegetation section of

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fire benefits are the basis for the agency policy to allow fire to play its natural role in the backcountry.		the DEIS, p.95. The purpose and need of this project, DEIS, p.4 does not include an objective to alter fire regimes or reduce fuels.
Please don't use my tax dollars to stop a beneficial natural disturbance event. Some trees die in a fire. These dead and dying trees benefit certain bird and mammal species that exist in the Powell Divide project. *(see Opposing Science Attachment #8 in literature review*)	4	The Wildlife section in the DEIS, p.143, addresses the effects to certain bird and mammal species in the no action and action alternatives. We have no knowledge of a project in the vicinity of the Flint Foothills project area called the Powell Divide project. Literature cited in the Opposing Science Attachments is reviewed in table B-2 in appendix B.
We note again that a number of the units will exceed 40 acres in size. Please provide a complete analysis in the draft EIS as to how these large openings will impact wildlife.	13	The rationale for creating large openings was to encompass past disturbance patterns that created the original area proposed for treatment, Vegetation section of the DEIS, p. 64. The Wildlife section of the DEIS, pp. 176 addresses effects of large openings for black-backed woodpecker, great gray owl, and migratory birds (i.e., olive-sided flycatcher).
How much habitat for these species has been lost due to past logging, how much habitat remains~ and what is the impact of this reduced habitat on their populations in regards to whether or not remaining forests are providing sink or source habitat.	13	Past timber harvest, in addition to other past activities, has been addressed for wildlife species as part of the existing condition, Wildlife section of the DEIS, p. 143. Existing suitable habitats are expected to function as source habitats because they contain

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		characteristics expected to support species life history requirements.
Please define how the proposed logging of old growth will affect wildlife species that use old growth habitat	13	The effects of timber harvest in old growth stands is addressed for a number of species in this analysis in the Wildlife section of the DEIS, p. 143.
Please define the impact of the project on the goshawk, an indicator for forest interior wildlife, as per the southwest goshawk guidelines, and use their vegetation structural stages.	13	The Wildlife section of the DEIS, starting on p. 217 addresses effects to northern goshawk. The Northern Goshawk Northern Region Overview (2009) states that VSS diameter classes used by Reynolds et al. (1992) are not readily comparable to the diameter classes present in Region 1, and that it was necessary to combine VSS classes 4, 5, and 6 (Reynolds et al. 1992) into one size class (> 10" d.b.h.) to compare and reflect mature and older forest in Region 1.
Please map all the known goshawk territories; and define the current and expected level of habitat in each territory	13	The analysis for effects to goshawk includes measure of available habitat within the project area. Individual territory and home range boundaries are not identified for this species within the project area.
Please define the impact of both clear cutting and commercial thinning on goshawk prey species as per the current best science and any forest monitoring data.	13	Timber harvest effects to snowshoe hare and red squirrel as goshawk prey species are addressed in the Wildlife section of the DEIS, pp. 219.

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Please provide a summary of the status of the goshawk population trend and productivity within the project area and the Beaverhead Deerlodge National Forest.	13	The northern goshawk was removed from the Region 1 sensitive species list in 2007 based on based on best available scientific information concerning ecological status, amount and distribution of habitats, grid-based species inventory. The 2005 Region-wide goshawk survey, in combination with known active nest sites from 2000-2004 indicate that goshawks are well-distributed across the BDNF. Long-term monitoring of goshawk population nesting and productivity has been conducted by Jack Kirkley, University of Montana-Western since 1998 in the southwestern portion of the BDNF on the Dillon, Wisdom, and Wise River Ranger Districts. Successful fledging of young in active territories varied annually, ranging from 33% to 84% from 2000 to 2005. Population trend was not analyzed. Clough (2000) reported on goshawk productivity over two years in the north Flint Creek Range, a portion of which encompassed the project area. Annual productivity varied between years, averaging a mean of 2.56 young fledged per nest from 18 nests monitored.
Please address what the expected impact has been on the goshawk from all the previous logging in the project area and across the forest.	13	Past timber harvest has been incorporated into the evaluation of existing suitable and unsuitable habitats for goshawk in the

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		Wildlife section of the DEIS, starting on page 217.
What is the conservation strategy for the flammulated owl in the project area? What is the estimated effectiveness of this strategy as per the current best science?	13	Forest Plan FEIS (pg. 688) states that the "Conservation Assessment of the Northern Goshawk, Black-Backed Woodpecker, Flammulated Owl, and Pileated Woodpecker in the Northern Region (Samson 2006) provides guidance for the assessment and management of effects to flammulated owls. That assessment is supplemented by "Habitat Estimates for Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten, and Fisher (Samson 2006).
Since snag numbers are very low, relative to the entire forest, in the Flint Uplands area, what is this cumulative impact on forest wildlife associated with snags currently estimated to be? Where are sillk [sink] areas expected to occur both now, and after logging? What percentage of the landscape can be sink habitat before viability of snag-associated \\·lldlife is lost in this landscape?	13	The Forest is not aware of snag density analyses conducted specifically for the Flint Uplands Management Area. Activities proposed within the Flint Uplands Management Area under this project total 84 acres and consist of precommercial thinning activities that are not expected to impact snag availability. We are assuming the commenter is referring to the Clark Fork-Flints landscape. Cumulative effects to those cavity-nesting species addressed in the wildlife specialist report is provided in the DEIS.

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		The wildlife analysis in the DEIS does not analyze habitats as potential population sinks. Instead, the analysis classifies habitats as suitable or unsuitable to support a given species before and after project implementation.
Since the Forest Plan does not require that any harvest units have any snags, please define how the impact of logging will be monitored on wildlife dependent upon snags.	13	Forest Plan snag standards require retention of snags within treatment units if an area-wide snag analysis has not been completed. No areawide assessment has been completed for this project.
Since there is no MIS for snags, specifically how is the impact of past and planned logging going to be determined for snag-associated wildlife? Will this methodology be scientifically valid?	13	The DEIS describes areas that may currently be snag-deficient due to past logging, Vegetation section of the, DEIS p. 95. Current and foreseeable projects would adhere to Forest Plan snag retention standards.
As noted before, please include a conservation strategy for woodpecker management areas in all action alternatives, as *per* the current best science.	13	Conservation strategies are best completed for the population as a whole, because usually the entire population does not reside solely in the project area. The Forest Plan FEIS (pg. 688) states that the “Conservation Assessment of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, and Pileated Woodpecker in the Northern Region (Samson 2006) provides guidance for managing and assessing effects to these species. That assessment is

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		supplemented by "Habitat Estimates for Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten, and Fisher (Samson 2006), and other sources pertaining to raptor and carnivore guidance,
The wildlife rationale for burning forests was not identified in the scoping notice. How is this proposed burning expected to affect wildlife. Please include an analysis of prescribed burning on wildlife in your NEPA analysis.	13	The effects of prescribed burning on wildlife are addressed in the Wildlife section of the DEIS, p. 165.
Please define the habitat effectiveness of big game habitat DURING logging in the summer, including all roads with motorized activity.	13	The Wildlife section of the DEIS, starting on page 208, addresses big game secure habitat and Open Motorized Road and Trail Densities (OMRTDs) before, during, and after implementation.
Please analyze and map the acres of big game security as per the Hills et al 1991 definition before and after logging.	13	The Wildlife section of the DEIS, starting on page 208 discloses the effects to elk secure areas (hunting season) using Forest Plan direction that was based on management recommendations from Christensen et al. (1993), Wisdom (2004) and the Yellowstone Grizzly Bear Amendment (USDA Forest Service 2006) for the same reasons disclosed in the Forest Plan FEIS (pp. 488-489, 513-517, 684-685 and 697). Christensen et al. (1993) considered Hillis et al. during development of their recommendations and

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		considerations. Also see Rohrbacher 2011 in appendix F of the DEIS for more analysis of other science and rationale for selection of secure areas (as measured by OMRTD) as the preferred analysis method.
The rationale for the project which includes reducing stand density was not supported with any reasons why this should be achieved. The rationale should include a recognition that forest thinning will be highly detrimental to wildlife, and a discussion provided as to why these detrimental impacts will be justified by some other benefit.	13	The rationale for proposed treatments is tied to the purpose and need, DEIS, p.4. Effects to wildlife species are addressed in the Wildlife section of the DEIS, p. 143.
Since the Beaverhead-Deerlodge National Forest is considered occupied lynx habitat, the agency needs to complete formal consultation with the USF\VS on management of this occupied habitat before any site specific projects of the Forest Plan are implemented.	13	The Beaverhead-Deerlodge National Forest is considered unoccupied at this time. Lynx are not listed on the species list from the USFWS (USDI Fish and Wildlife Service 2012). Lynx have been analyzed according to regional direction (USDA Forest Service 2009), but no consultation with the USFWS is required.
According to the NRLMD, many of the proposed actions will violate the NRL11D, including pre-commercial thinning.	13	Current direction for unoccupied forests is to consider lynx direction using the Northern Region Lynx Direction table with standards and guidelines. This has been done, as shown in the wildlife appendix F. Vegetation standard S5 applies to precommercial thinning and generally restricts precommercial thinning that reduces winter snowshoe habitat (with a few listed exceptions).

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There are currently no management indicator species for snags, old growth, forest interior habitat, and neotropical migratory bird habitat. The agency has no means of monitoring the impact of past and future logging projects on almost all wildlife species as a result, in violation of the NFMA.	13	NFMA regulations do not require that management indicator species (MIS) be selected for all habitat types or vegetation management activities. MIS were selected during Forest Plan Revision; the forest planning record includes documentation of the rationale for selection of MIS.
What is the trend of the goshawk population in the project area and across the Forest?	13	The northern goshawk was removed from the Region 1 sensitive species list in 2007 based on based on best available scientific information concerning ecological status, amount and distribution of habitats, and grid-based species inventory. The 2005 Region-wide goshawk survey, in combination with known active nest sites from 2000-2004 indicate that goshawks are well-distributed across the BDNF. Long-term monitoring of goshawk population nesting and productivity has been conducted by Jack Kirkley, University of Montana-Western since 1998 in the southwestern portion of the BDNF on the Dillon, Wisdom, and Wise River Ranger Districts. Successful fledging of young in active territories varied annually, ranging from 33% to 84% from 2000 to 2005. Population trend was not analyzed. Clough (2000) reported on goshawk productivity over two years in the north Flint Creek Range, a portion of which

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		encompassed the project area. Annual productivity varied between years, averaging a mean of 2.56 young fledged per nest from 18 nests monitored.
Since the goshawk was dropped an a management indicator species for the Forest in the plan revision, what monitoring data obtained during that planning period indicated that this species was a poor indicator of forest interior habitat, to justify dropping this MIS?	13	Rationale for selection of MIS is contained in the Forest Plan FEIS (pg. 34).
How will impacts of wildlife requiring relatively dense, undisturbed forests, including forests with good populations of red squirrels, be met in the project area to ensure viability?	13	Effects to red squirrels are addressed as goshawk prey species in the Wildlife section of the DEIS, p. 219.
Roadless		
Please utilize the NEPA process to clarify any roadless boundary issues. Please examine if these unroaded areas adjacent to roadless areas have wilderness qualities.	1 and 12	The 2001 Roadless Area Conservation Rule (RACR) formalized the boundaries of earlier Forest Plan Inventoried Roadless Areas boundaries, through electronic maps developed nationally in 1999. The wilderness attributes of the Roadless and unroaded analysis for this project is addressed in the Roadless section of the DEIS starting on page 359.
Increases in noxious weeds within IRAs is a violation of the roadless area conservation rule.	3	Thank you for your comment. There are no proposed treatment units with IRAs. The Roadless Area Conservation Rule does not direct management of invasive species. The roadless rule does indirectly influence the prevention of invasive species spread by limiting the construction of roads in Inventoried Roadless Areas.

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Aquatic Species/Hydrology/Water Quality/Riparian Areas/Soils		
Aquatic Species		
We request a careful analysis of the impacts to fisheries and water quality, including considerations of sedimentation, increases in peak flow, channel stability, risk of rain-on-snow events, and increases in stream water temperature. Please disclose the locations of seeps, springs, bogs and other sensitive wet areas, and the effects on these areas of the project activities. Where livestock are permitted to graze, we ask that you assess the present condition and continue to monitor the impacts of grazing activities upon vegetation diversity, soil compaction, stream bank stability and subsequent sedimentation. This watershed has been proposed as bull trout critical habitat. Will you meet the requirements of bull trout critical habitat?	1 and 12	The environmental analysis for this project will identify sources of sedimentation, identify where there are flow increases as a result of the project, identify impacts to stream channels as a result of the project, and identify and analyze changes in stream temperature as a result of the project. Springs, seeps and other wet areas will be identified and protected. This project will not analyze the effects of livestock grazing, but will consider on-going impacts as they relate to this project. The Hydrology section of the DEIS analyzes effects to water quality, water quantity and floodplains and wetlands beginning on page 279. The Aquatics section of the DEIS, addresses the aquatic MIS and the effects to sensitive aquatic species beginning on page 317. Bull trout have not been identified in watersheds within the project area. Bull trout critical habitat has not been proposed within the planning area

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		Post implementation monitoring would be done consistent with Forest Plan Monitoring and Evaluation outlined in the Forest Plan, pp. 271-280, including impacts of grazing. Typically, each timber sale is reviewed for implementation and effectiveness of project design features and mitigation measures, as well as resource issues important to the individual sale.
Please disclose in the NEPA document the results of up-to-date monitoring of fish habitat and watershed conditions and how this project will affect the fish in the project area.	1 and 12	The Aquatics Species section of the DEIS identifies and discloses current stream conditions and effects to sensitive aquatic species in the project area beginning on page 318. Past monitoring information is on file at the Beaverhead-Deerlodge National Forest.
Your plans will kill the trout. Besides putting toxic chemicals into the streams that are their home, you are also raising the 98igantean98s and causing erosion when you cut trees.	8	The Hydrology section of the DEIS discusses sediment delivery and effects to stream temperatures starting on page 279. The project design includes RCA buffers along all stream channels to protect from sediment and increases in temperatures. The Aquatic Species section of the DEIS, p. 322 discusses effects to sensitive aquatic species. Treatment of noxious weeds would be consistent with direction found in the

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		Beaverhead-Deerlodge Noxious Weed Control Record of Decision (2002).
Hydrology		
Water Quality		
It is extremely important the FS disclose the environmental baseline for watersheds. Therefore, proper disclosure of baseline conditions would mean estimates of stream stability, pool frequency conditions, and water temperature range—essentially the values of Riparian Management Objectives along with such parameters as sediment levels. Generally, this means their condition before development or resource exploitation was initiated. For example, the baseline condition of a stream means the habitat conditions for fish and other aquatic species prior to the impacts of road building, logging, livestock grazing, etc. When such information is provided, comparison with the current conditions (after impacts of development) will aid in the assessment of cumulative effects of all alternatives.	1 and 12	The Hydrology section of the DEIS, p.273, discloses the existing, (baseline) conditions) and effects on riparian conservation area.
Watershed enhancement can be particularly important where there are water quality impaired streams listed under Section 303(d) of the Clean Water Act in a project area. There appear to be several water quality impaired waterbodies listed on the Montana Dept. of Environmental Quality's (MDEQ's) Clean Water Act Water Quality Assessment Database in the project area, including Flint Creek itself (see http://cwaic.mt.gov/query. aspx). There may be additional water quality impaired streams within the project area. It is likely that activities proposed with the Flint Foothills Vegetation Management have potential to affect sediment/siltation and turbidity impairments in project watersheds. There appear to be several water quality impaired waterbodies listed on the Montana Dept. of Environmental Quality's (MDEQ's) Clean Water Act Water Quality Assessment Database in the project area, including Flint Creek itself (see http://cwaic.mt.gov/query. aspx). There may be additional water quality impaired streams within the project area. It is likely that activities proposed with the Flint Foothills Vegetation Management have potential to affect sediment/siltation and turbidity impairments in project watersheds. It is important that all water quality impaired waterbodies within the project area be identified. It is not clear which TMDL Planning Area the proposed project may affect since the NOI included little information on watersheds in the project area, although it is likely that the Flint Creek TMDL Planning Area will be affected. It is important that all water quality impaired waterbodies within the project area be identified. It is not clear which TMDL Planning Area the proposed project may affect since the NOI included little information on watersheds in the project area, although it is likely that the Flint Creek TMDL Planning Area will be affected. It is important that the proposed project not cause further degradation of impaired waters, and that project activities be consistent with the MDEQ's development of Total Maximum Daily Loads (TMDLs) and Water Quality Restoration Plans to improve water quality and restore full support of beneficial uses in the water quality impaired streams that may be impacted by the project.	11	The Hydrology section of the DEIS, p 279, discloses the effects of this project on water quality. All streams with water quality impairment are identified. No further degradation of water quality in project streams is expected. Project design features (chapter 2) for this project are designed to prevent sedimentation that would result from project activities. The stream segments identified in the comment are outside of the project area.

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We recommend that the Beaverhead-Deerlodge NF coordinate with MDEQ TMDL program staff to assure consistency of proposed management actions with TMDLs and Water Quality Restoration Plans prepared by MDEQ (contact MDEQ staff such as Mr. Mark Kelley at 406-444-3508, Mr. Dean Yashan at 406-444-5317, and/or Mr. Robert Ray at 406-444-5319).	11	Thank you for your offer of assistance.
Special attention should be made regarding Montana's identification of water bodies with impaired uses in their Clean Water Act Section 303 (d) report. The EIS should identify water bodies in the analysis area listed by the Montana Dept. of Environmental Quality (MDEQ) as water quality impaired under Section 303(d) of the Clean Water Act (see http://cwaic.mt.gov/), as well as the magnitude and sources of such impairment. For example two segments of Flint Creek are listed as water quality impaired. A 28.1 mile Flint Creek segment from Georgetown Lake to the confluence with Boulder Creek (Waterbody ID MT76E003_011) is listed as water quality impaired due to non-support of aquatic life, cold water fishery, and drinking water uses, and partial support of primary contact recreation. Probable causes of water quality impairment are listed as metals (antimony, arsenic, cadmium, copper, lead and mercury), alteration in stream-side or littoral vegetative covers, low flow alterations, and sedimentation/siltation, and probable sources of impairment are identified as abandoned mine lands (inactive), agriculture and grazing in riparian zones.	11	Table 75 on page 267 lists water quality impaired streams. The effects of this project on water quality are disclosed. No further degradation of water quality in project streams is expected. Project design features for this project, DEIS p. 43, are designed to prevent sedimentation as a result of the project activities. The stream segments listed in the comment are outside of the project area.
A downstream 16.9-mile Flint Creek segment from Boulder Creek to the confluence with the Clark Fork River (Waterbody ID MT76E003J312) is also listed as impaired due to non-support of aquatic life, cold water fishery, and drinking water uses, and partial support of primary contact recreation and industrial uses. Probable causes of impairment are listed as metals (arsenic, cadmium, copper, iron and lead), alteration in stream-side or littoral vegetative covers, nitrogen, phosphorus and turbidity, and probable sources of impairment are identified as abandoned mine lands (inactive), agriculture, grazing in riparian zones, and streambank modifications and/or 100igantean100s100ion.	11	TMDL-limited streams within the project area are addressed in the Hydrology section of the DEIS, p. 279. The stream segments listed in the comment are outside of the project area.
Piease note that the Watershed Management Section (WMS) at DEQ is currently developing sediment Total Maximum Daily Loads (TM DLs) for this watershed. The WMS anticipates that these TMDLs will be complete this year. The WMS notes that during the development of these sediment TMDls it was apparent that fire timber salvage activities from nearly ten years ago have likely increased upland erosion in the Upper Smart Creek and the South Fork Willow Creek. This was due to drag line routes and off-road heavy equipment pathways in the watershed (see the attached photo).	15	TMDL-limited streams within the project area are addressed in the Hydrology section of the DEIS, p. 279. The stream segments listed in the comment are outside of the project area.
The WPS requests that the B-D National Forest addresses how they will minimize upland erosion during the proposed project.	15	The Disturbed WEPP model was run to generate predicted erosion rates for the existing condition and following implementation of the proposed harvest. The

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		analysis action that probability of erosion would increase in one unit, 73S, from 0% to 2%. However, model results for the proposed action indicate an average annual erosion rate of 0 tons/acre/yr. for each modeled harvest unit. The Region 1 Soils Quality Standards (SQS) S state that the tolerable soil loss rate (average annual) is generally less than 1 to 2 tons per acre per year (USDA Forest Service, 1999). Based on the WEPP modeling, SQS for surface erosion would continue to be met The WEPP results do not take into account PDFs listed in the mitigation measure section; in particular, providing drainage control and slash placement on skid trails. These PDFs will ameliorate disturbance associated with harvest, reduce erosion potential, and hasten soil, DEIS. p.43.
Riparian Areas We note that temperature effects from riparian canopy/shade removal can persist downstream for significant distance in some small stream systems (e.g., up to 10km). It is important that proposed activities be consistent with the riparian management objectives described in the ICB Strategy, which include: * Achieve physical integrity of aquatic ecosystems; * Provide an amount and distribution of woody debris sufficient to sustain physical and biological complexity; * Provide adequate summer and winter thermal regulation;	11	All Forest Plan standards will be met, including those associated with RCAs. The Forest Plan Consistency Checklist is provided in appendix C. The Hydrology section of the DEIS, starting on page 279 shows that water quality

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* Provide appropriate amounts and distributions of source habitats for riparian- or wetland-dependent species; and * Restore or maintain water quality and hydrologic processes. * Restore or maintain naturally functioning riparian vegetation communities.		would be improved by implementing either action alternative. No vegetation activities are proposed in the RCAs; newly constructed temporary road in the RCAs, 0.5 miles, would be obliterated following implementation of the vegetation activities.
Additionally, DEQ would like to promote the Forest Service's adherence to Inland Fish Strategy (INFISH) riparian guidelines to assure streams are not at risk of increased temperatures or sedimentation due to the proposed activities.	15	Thank you for your comment and support. The project is consistent with all Forest Plan RCA standards, see the Forest Plan Consistency Checklist, appendix C.
Soils		
Prescribed fires and mechanical treatments may adversely affect soil productivity. NFMA requires the FS to "not allow significant or permanent impairment of the productivity of the land." [36 C.F.R. § 219.27(a)(1).] NFMA requires the Forest Service to "ensure that timber will be harvested from National Forest System lands only where—soil, slope, or other watershed conditions will not be irreversibly damaged." [16 U.S.C. 1604 (g)(3)(E).] The Sheep Creek Salvage FEIS (USDA Forest Service, 2005a) states at p. 173: Noxious weed presence may lead to physical and biological changes in soil. Organic matter distribution and nutrient flux may change dramatically with noxious weed invasion. Spotted knapweed (Centaurea biebersteinii D.C.) impacts phosphorus levels at sites (LeJeune and Seastedt, 2001) and can hinder growth of other species with allelopathic mechanism. Specific to spotted knapweed, these traits can ultimately limit native species' ability to compete and can have direct impacts on species diversity (Tyser and Key 1988, Ridenour and Callaway 2001).	1 and 12	The EIS cited was completed for the Sheep Creek fire salvage project on the Wisdom Ranger District. Although the research papers address spotted knapweed effects in grassland plant communities (versus forested communities), the papers cited in the Soils section of the DEIS, p. 236 are still relevant to the Flint Foothills project. LeJeune and Seastedt (2001) reviewed the literature along with their own unpublished data and state that based on preliminary evidence, it appears that knapweed is a strong competitor for phosphorous and water, and is able to do well in grasslands once limited by nitrogen. Nitrogen is no longer a limiting resource due to

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		increased anthropogenic disturbances over the past century that has made nitrogen more available (through reduced fire frequency, atmospheric deposition of nitrogen, and possibly direct and indirect fertilization from grazing). Phosphorous and water are the new limiting resources and knapweed does well in competing for them. Tyser and Key (1988) performed a study in Glacier National Park and found spotted knapweed could invade native fescue grasslands. Further, they found an inverse relationship between knapweed stem density and species richness and frequency of several species, and concluded that knapweed has the ability to alter plant community composition. Ridenour and Calloway (2001) performed a greenhouse study to determine the allelopathic affects that spotted knapweed has on Idaho fescue. They found that spotted knapweed reduces Idaho fescue growth primarily through allelopathy but also through resource competition (nutrients, space, water). While the potential for impacts to soil productivity exists as a result of noxious weed infestation, the actual impact to long term soil productivity is likely minimal, due

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		to the following: The Invasive Plant resource report describes a low risk of noxious weeds becoming established and/or spreading in proposed treatment units within the analysis area. The mitigation measures listed in the DEIS include monitoring for and treating noxious weeds within units and along roads. Treatment of noxious weeds with herbicides on the Beaverhead-Deerlodge NF has been effective (infested acres reduced by 49% over the last ten years on the Pintler Ranger District) (Rasor 2012).
Please provide estimates of current detrimental disturbance in all previously established activity areas in the watersheds affected by the proposal. Please disclose the link between current and cumulative soil disturbance in project area watersheds to the current and cumulative impacts on water quantity and quality. Please disclose if there are any WQLS streams or TMDL streams in the project area. Please disclose measures of, or provide scientifically sound estimates of, detrimental soil disturbance or soil productivity losses (erosion, compaction, displacement, noxious weed spread) attributable to offroad vehicle use.	1 and 12	Soil cumulative effects occur only when soil impacts from multiple management activities occur on the same location. Therefore, only the activity areas associated with the proposed action were analyzed for existing soil disturbance plus any additional disturbance expected from the proposed action. The FS does not analyze soil disturbance at the watershed scale because soil disturbance analysis, as assessed under the Northern Region Soil Quality Standards (USDA Forest Service 1999), is a site specific, activity area approach. Therefore, we use

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		a harvest unit as the analysis area so that we can determine the effects of the harvest activity on the soil resource. Since DSD is a percent of the area, if we were to do an assessment of existing DSD at the watershed scale and then estimate the increase due to the project, we would show no increase. Additionally, due to the inherent variability of soil properties such as texture, organic matter and surface cover, and the variable soil response to previous management activities, it is not feasible to analyze past management effects at the landscape scale in a meaningful way. Existing detrimental soil disturbance (DSD) was determined by Forest Service soil scientists with onsite visits to each timber harvest unit is included in the Soils section of the DEIS, table 69 p. 243. No DSD attributable to offroad vehicle use was noted. The Hydrology section of the DEIS, p. 267 table 75 identifies 303 (d) streams. The analysis discloses impacts on water quality and water quantity.
Please disclose how the proposed “treatments” would be consistent with Graham, et al., 1994 recommendations for fine and coarse woody debris, a necessary consideration for sustaining long-term soil	1 and 12	The importance of organic matter maintenance through coarse

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productivity.		woody debris recruitment is recognized and provided for by recommendations in the R1 supplement to FSM 2550. Coarse woody debris data ranges from 1 to 17 tons/acre in the proposed harvest activity areas. According to the R1 supplement to FSM 2550, coarse woody debris objectives should follow research guidelines such as those contained in Graham et al. 1994. Leaving 7-25 tons/acre of pieces with a diameter of 3" and greater meets recommendations set forth in Graham et al. for habitat types present in the project area. For practical purposes, a range of 7-12 tons/acre should be left in each unit, Project Design Feature and Mitigation Measures section in chapter 2, p. 43.
Please disclose the results monitoring of weed treatments on the BDNF that have been projected to significantly reduce noxious weed populations over time, or prevent spread. This is an ongoing issue of land productivity.	1 and 12	The Invasive Plant section of the DEIS, p.129. discusses the results of 2000 and 2012 invasive plant inventories; they indicate that infestations are still present but total acres infested has been reduced by 48 percent under the current weed control program. Treatment implementation and effectiveness monitoring of these infestations will occur on an annual basis by district weed control crews and be reported in the Forest Service's Activity Tracking System (FACTS) database consistent with Forest

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		Plan Monitoring Direction.
Harvey et al., 1994 state: The ...descriptions of microbial structures and processes suggest that they are likely to provide highly critical conduits for the input and movement of materials within soil and between the soil and the plant. Nitrogen and carbon have been mentioned and are probably the most important. Although the movement and cycling of many others are mediated by microbes, sulfur phosphorus, and iron compounds are important examples. The relation between forest soil microbes and N is striking. Virtually all N in eastside forest ecosystems is biologically fixed by microbes... Most forests, particularly in the inland West, are likely to be limited at some time during their development by supplies of plant-available N. Thus, to manage forest growth, we must manage the microbes that add most of the N and that make N available for subsequent plant uptake. (Internal citations omitted.) Lacy, 2001 examines the importance of soils for ecosystem functioning and points out the failure of most regulatory mechanisms to adequately address the soils issue. From the Abstract: Soil is a critical component to nearly every ecosystem in the world, sustaining life in a variety of ways—from production of biomass to filtering, buffering and transformation of water and nutrients. While there are dozens of federal environmental laws protecting and addressing a wide range of natural resources and issues of environmental quality, there is a significant gap in the protection of the soil resource. Despite the critical importance of maintaining healthy and sustaining soils, conservation of the soil resource on public lands is generally relegated to a diminished land management priority. Countless activities, including livestock grazing, recreation, road building, logging, and mining, degrade soils on public lands. This article examines the roots of soil law in the United States and the handful of soil-related provisions buried in various public land and natural resource laws, finding that the lack of a public lands soil law leaves the soil resource under protected and exposed to significant harm. To remedy this regulatory gap, this article sketches the framework for a positive public lands soil protection law. This article concludes that because soils are critically important building blocks for nearly every ecosystem on earth, an holistic approach to natural resources protection requires that soils be protected to avoid undermining much of the legal protection afforded to other natural resources. The article goes on: Countless activities, including livestock grazing, recreation, road building, logging, mining, and irrigation degrade soils on public lands. Because there are no laws that directly address and protect soils on the public lands, consideration of soils in land use planning is usually only in the form of vaguely conceived or discretionary guidelines and monitoring requirements. This is a major gap in the effort to provide ecosystem-level protection for natural resources. The rise of an “ecosystem approach” in environmental and natural resources law is one of the most significant aspects of the continuing evolution of this area of law and policy. One writer has observed that there is a fundamental change occurring in the field of environmental protection, from a narrow focus on individual sources of harm to a more holistic focus on entire ecosystems, including the multiple human	1 and 12	Harvey and others (1994) review the effects of management on soil properties, processes, and productivity for eastern Washington and Oregon soils. Topics for “eastside soils” covered include physical and chemical properties, organic matter, microbiology, fire, fertilizer application, and the influence of weather and stand on soil water use in ponderosa pine. Since the paper covers a different geographical area, the specific information presented on eastside soils such as ash-influenced soil properties are not applicable; however, general information/concepts presented, such as that found in the Microbial Ecology section quoted in your comment, are relevant to the Flint Foothills project. We agree that microbial processes are important mediators in nutrient cycling in soils. By following prescribed project design features and mitigation measures (chapter 2) to limit the amount of detrimental soil disturbance associated with project activities and meeting the soil quality standards, these microbial-mediated soil functions would be provided for.

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sources of harm within ecosystems, and the complex social context of laws, political boundaries, and economic institutions in which those sources exist. As federal agencies focus increasingly on addressing environmental protection from an holistic perspective under the current regime of environmental laws, a significant gap remains in the federal statutory scheme: protection of soils as a discrete and important natural resource. Because soils are essential building blocks at the core of nearly every ecosystem on earth, and because soils are critical to the health of so many other natural resources—including, at the broadest level, water, air, and vegetation—they should be protected at a level at least as significant as other natural resources. Federal soil law (such as it is) is woefully inadequate as it currently stands. It is a missing link in the effort to protect the natural world at a meaningful and effective ecosystem level. … This analysis concludes that the lack of a public lands soil law leaves the soil resource under-protected and exposed to significant harm, and emasculates the environmental protections afforded to other natural resources. (Emphasis added.) The problems Lacy (2001) identifies of regulatory mechanisms exist in Regional and Forest-level standards and other guidance applicable for the proposed project.		This comment seems to imply that maximum potential productivity is the goal. Forest soils are periodically limited by N, even under unmanaged conditions. Short-term productivity is often measured over a few years, or even up to a decade and within this time, productivity may decline. Long-term productivity is measured at least at a rotation, and some suggest that the appropriate measure is three rotations. Also refer to response directly above. Lacy (2001) “examines the gap with respect to soil conservation and protection in current federal public land and resources law.” While Lacy provides a discussion on the history of public lands soil law and associated flaws, he does state, “Of all public natural resource laws, the National Forest Management Act (NFMA) provides by far the greatest protection to the soil resource.” Lacy also acknowledges that the Forest Service has developed “somewhat extensive internal standards in its Forest Service Manual (FSM) and Forest Service Handbook (FSH).”

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		National Forest Management Act (NFMA) of 1976 requires that the Forest Service (FS) manage National Forest System lands without substantial and permanent impairment of land productivity and to maintain or improve soil quality. To assure compliance with the NFMA requirement, the FS established Regional Soil Quality Standards. In Region 1 the SQS were most recently revised in 1999. Soil productivity is defined in FSM 2500, Chapter 2550-Soil Management (Forest Service Manual, National Headquarters (WO), Washington DC, 2010) as "the inherent capacity of the soil resource to support appropriate site-specific biological resource management objectives, which includes the growth of specified plants, plant communities, or a sequence of plant communities to support multiple land uses." Because soil productivity is not easily measured (Powers and others 1998; Powers 2002), direct measurement of soil productivity is rarely used, even in research. Rather, surrogates of soil productivity are measured. The Northern Region uses soil disturbance as the surrogate for potential effects to soil productivity and has established

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		thresholds for allowable disturbance. According to Powers (1998) the goal is to define the functional elements of soil that sustain productivity and to identify soil quality indicators of these functions. He further describes the attributes of useful indicators. The indicators that the Northern Region has selected are intended to provide an assessment of potential management effects on the soil functions, which work in combination to produce biomass (productivity). Soil productivity is not a stand-alone soil function. Several soil functions contribute to soil productivity. Although one or more soil functions may be affected by previous or proposed activities, soil productivity may or may not be maintained.
We also recommend at least some minimal amount of field soil monitoring following harvests using the most recent version of the Region 1 Soil Quality Disturbance Monitoring Protocol to verify compliance with the Region 1 soil quality standards of not exceeding 15% cumulative detrimental disturbance.	11	Specific units requiring monitoring to ensure compliance with the R1 SQS can be found in the Soil section of the DEIS, table 68 p. 240.
Climate Change		
Published scientific reports indicate that climate change will be exacerbated by logging due to the loss of carbon storage. Additionally, published scientific reports indicate that climate change will lead to increased wildfire severity (including drier and warmer conditions that may render obsolete the proposed effects of the Project). The former indicates that the Flint Foothills Vegetation Project may have a significant adverse effect on the environment, and the latter undermines the central underlying purpose of the Project. Therefore, the Forest Service must candidly disclose, consider, and fully discuss the published scientific papers discussing climate change in these two contexts. At least the Forest Service should discuss the attached following studies: *(See literature review)* • Depro, Brooks M., Brian C. Murray, Ralph J. Alig, and Alyssa Shanks. 2008. Public land, timber harvests,	4	Discussions of forest carbon cycling and storage (i.e., “carbon flux”) are in the Vegetation section of the DEIS, p. 65. The Forest Service recognizes there is a cause-effect relationship between forests, actions that affect forest carbon

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and climate mitigation: quantifying carbon sequestration potential on U.S. public timberlands. Forest Ecology and Management 255: 1122-1134. • Harmon, Mark E. 2001. Carbon sequestration in forests: addressing the scale question. Journal of Forestry 99:4: 24-29. • Harmon, Mark E, William K. Ferrell, and Jerry F. Franklin. 1990. Effects of carbon storage of conversion of old-growth forest to young forests. Science 247: 4943: 699-702 • Harmon, Mark E, and Barbara Marks. 2002. Effects of silvicultural practices on carbon stores in Douglas-fir – western hemlock forests in the Pacific Northwest, USA: results from a simulation model. Canadian Journal of Forest Research 32: 863-877. • Homann, Peter S., Mark Harmon, Suzanne Remillard, and Erica A.H. Smithwick. 2005. What the soil reveals: potential total ecosystem C stores of the Pacific Northwest region, USA. Forest Ecology and Management 220: 270-283. • McKenzie, Donald, Ze'ev Gedalof, David L. Peterson, and Philip Mote. 2004. Climatic change, wildfire, and conservation. Conservation Biology 18:4: 890 -902.		cycles, and climate change. The primary relationship between forests, forest management, and climate change is the role forests play globally in removing and sequestering atmospheric carbon. Forests naturally cycle carbon. They are in a continual flux, both emitting carbon into the atmosphere and removing it (sequestration) through photosynthesis. The actions proposed under alternatives 2 and 3 may alter the rates and timing of that flux within the individually affected forest stands. These changes would be localized and infinitesimal in relation to the role the world's forests play in ameliorating climate change and indistinguishable from the effects of not taking the action. Meaningful and relevant conclusions on the effects of a relatively minor forest management action such as this on global greenhouse gas pools or global climate change is not possible, nor is it warranted in this case. However, as this is a relatively new public issue and currently of broad interest, the local effects on carbon stores and flux are discussed. Regional, continental, and global factors related to forest's influence on global climate change are also briefly discussed to provide

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		context for understanding the nature of these local effects. Treatments in alternatives 2 and 3 would reduce on-site carbon sources by removing the dead and dying lodgepole component, storing the majority of removed carbon in long-lived forest products such as lumber. Alternative 1 (no action) would leave these carbon sources in place, increasing the potential carbon release through such mechanisms as fire, decomposition, and oxidization of stored carbon into atmospheric carbon (Ryan et al. 2010). By moving decomposing carbon sources from the natural system to the economic system, it may be possible to increase the net carbon storage associated with the given stand. The extent to which there is a net carbon benefit in salvage operations depends on the answers to several questions: Is the turnover rate of carbon transferred to forest products greater than the carbon turnover rate on site? To what extent is site re-growth increased relative to the untreated condition? How much fossil fuel is used in the salvage and product manufacture and distribution operations (Binkley et al. 2007).

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		Forested environments over time are renewable carbon sinks. With the removal of the dead trees as proposed in the action alternatives, overall carbon sequestration would begin to increase more rapidly in the treated stands when compared to the no action alternative by increasing the health and vigor of the trees left on site, increasing the health and vigor of the understory vegetation, and promoting regeneration of seedlings for the next stand. In general, such management actions as those proposed in the project could improve the resilience of forests to climate-induced increases in frequency and intensity of disturbances such as fire and insect and disease epidemics. Utilizing harvested trees for long-lived forest products and renewable energy sources may help sustain the current strength of the carbon sink in U.S. forests (Birdsey et al. 2006 and 2007). Caution is advised against interpreting carbon storage gains from salvage harvest in any specific forest or stand as absolute net carbon gains. This only holds true if harvest does not occur elsewhere in the world to supply the same world demand

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		for timber. The result can be a net carbon impact if the timber is replaced in the marketplace with higher carbon source products such as steel or concrete, or if replacement timber is harvested in a manner that does not promote prompt reforestation (Ryan et al. 2010; Harmon 2009; Murray 2008; Wear and Murray 2004). The Depro et al. paper analyzes the potential effects of three scenarios over 228,000,000 acres of public forests. The Forest Service is proposing to harvest fewer than 2,700 acres, or 0.0013% of that amount. The harvest activities proposed by this project would fall into the business-as-usual (BAU) case as defined by Depro et al. For this scenario, findings suggest that "… public timberlands will continue to sequester carbon through the next century, though at a diminishing rate." Harmon 2001 does not specifically discuss either logging or wildfire severity – it centers on a discussion of scale when determining effects of forestry practices on carbon storage and the carbon uptake, carbon sequestration, and carbon storage in "young" forests versus live "old"

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		forests. In the portion analyzing dead trees, only when the trees die at a steady rate do they, as a collection, store carbon. In the project area, the action alternatives primarily salvage dead trees, most of which died over the course of only a few years and not at a steady rate. At the large spatial scale of this project, there would be more permanent carbon storage in the remaining live and regenerating trees than in the collection of dead trees. The minimal live tree removal would be focused on the smaller diameter trees (storing less carbon) which are likely to be younger than the trees remaining in the project area (storing more carbon). And while the author never defines “young” and “old” forests, there would be no salvage, thinning, or other treatment activities in areas where old growth characteristics would be removed and replaced with a “young’ forest. For alternative 2, treatments in old growth stands would not reduce the age, number of large trees, or basal area below the ‘minimum criteria’ required for Eastern Montana old growth, as described in Standard 1 for Vegetation in the Forest Plan (USDA Forest Service 2009a, pg.

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		44). This project also fits into one of the three scenarios given where carbon sequestration at the landscape scale is not in balance – when the disturbance regime increases in frequency or severity. The mountain pine beetle epidemic has increased the severity of disturbance across the landscape, leading to a decrease in stored carbon and an increase in released carbon. In Harmon et al. 1990, the effects on carbon storage from the conversion of old growth forests to young forests are analyzed. There will be no treatments in areas with defined old growth stands for alternative 3. For alternative 2, treatments in old growth stands would not reduce the age, number of large trees, or basal area below the 'minimum criteria' required for Eastern Montana old growth, as described in Standard 1 for Vegetation in the Forest Plan (USDA Forest Service 2009a, pg. 44). Harmon and Marks 2002 used a model to examine the effects of silvicultural and other treatments on the dynamics of living and dead pools of carbon in Pacific Northwest stands dominated by Douglas-fir and western hemlock. These forest types are vastly

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		different than the lodgepole pine and Douglas-fir types in the project area, so the results from the simulations cannot be transferred or inferred to the treatments in the project area with any kind of accuracy. The Homann et al. 2005 paper used soil survey information and measurements of carbon in old growth forests to predict spatial distribution of potential total ecosystem organic carbon for the Pacific Northwest Region. This project will have no treatments in old growth under alternative 3 and is treating very different forest types than those in the Pacific Northwest. For alternative 2, treatments in old growth stands would not reduce the age, number of large trees, or basal area below the 'minimum criteria' required for Eastern Montana old growth, as described in Standard 1 for Vegetation in the Forest Plan (USDA Forest Service 2009a, pg. 44). McKenzie et al. 2004 theorize what may happen to the distribution and abundance of plant species in some ecosystems if climatic change increases the amplitude and duration of extreme fire behavior. These effects may partially depend on the extent to

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		which vegetation structure and fuels are modified. The authors' state in the conclusion that "Anticipating the changing hazards in dynamic ecosystems that are responding to climatic change will be a formidable task for conservation managers, considering the high level of uncertainty about the magnitudes and rates of climatic change, especially for precipitation. In addition, given the complexity of ecosystem function and processes and the stochasticity of ecological disturbance, it is difficult to predict the effects of climatic change on natural resources." The writers of this paper admit that it is difficult to predict the effects of climate change on natural resources; they state they have identified an association of fire and quasi-periodic patterns (El Nino and La Nina) but have little understanding of how these indices will respond to climate warming, and their ability to extrapolate these associations into the future is poor. They also make the case that the use of fire and mechanical thinning for ecosystem restoration is incompatible with late-seral forest and riparian habitat, but fail to identify how much late-seral forest

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		habitats have been added because of fire suppression and management of species that depend on late-seral forest habitats.
We recommend that the Beaverhead-Deerlodge NF consider the climate change considerations discussed above, and include in the DEIS a summary of how the proposed project will address such considerations. For example, including a summary of how warming and drought due to climate change may influencing vegetative conditions. This will help disclose to the public that climate change is a factor influencing vegetative conditions, including bark beetle outbreaks.	11	Through the answer provided above and the Forest Carbon Cycling and Storage discussion in the Vegetation section of the DEIS, p. 65, this analysis does consider climate change considerations. The Vegetation analysis does assess how climatic changes are influencing vegetation conditions through natural disturbances, including insects and fire.
Cultural Resources		
We note a good deal of planning has already occurred for this proposed undertaking but did not see cultural resources as issues or concerns.	9	Heritage resources will be avoided and/or site mitigation will be developed prior to project implementation, DEIS, p. 393.
We would like to see what is being proposed for consideration of cultural resources under 36CFR800 or the R-1 cultural resources PA.	9	In response to the monitoring question: Yes, we are monitoring and sites are being avoided
The proposed Flint Foothills Project located in the Beaverhead-Deerlodge National Forest is within the inherent ancestral lands of the Shoshone and Bannock people, and continues to hold Important cultural properties, traditional hunting, fishing and gathering activities still practiced today by members of The Shoshone-Bannock Tribes. According to the information provided, project activities include constructed skid trails,-temporary roads, and road maintenance which would consist of grading. The project will consist of ground disturbing activities. In the event of an inadvertent discovery (cultural resources and/or human remains) the Tribes request an immediate Stop Work order of construction activitieS and immediate notification to HeTO. Construction shall cease until proper treatment of cultural resources and/or human remains is achieved_ The Tribes also request any current archaeological survey	14	The cultural resources analysis will be completed for the project area using a combination of three standard approaches to cultural resources inventory in a given geographic area. They include Class I, Class II, and Class III inventory strategies. A Class I inventory includes a basic literature review to identify previous archaeological and

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reports for the area of potential effects (APE). The purpose of this letter is to provide technical input and not intended as formal government-to-government consultation. Should there be any Questions or concerns please f eel free to contact me at: (2GB) 478-3707 or email at: csmith@sbtribes.com Carolyn Boyer-Smith Cultural Resources Coordinator The Shoshone-Bannock Tribes		historic research done in the area and to determine what information previous work may have revealed. A wide array of standard references were reviewed, including the NRHP, the Montana State Historic Preservation Plan, General Land Office Plats, Homestead Entry Surveys, Mineral Surveys, land status maps, historic Forest Service maps and professional reports, and historic monographs directly related to the archaeology and history of the Flint foothills area. Class II inventory is a based on the “Site Identification Strategy” (SIS) found in the Region I Programmatic Agreement between the Forest Service and the Montana State Historic Preservation Officer. One hundred percent of high probability areas are intensively surveyed. Thirty percent of moderate probability areas and 10 percent of low probability areas are covered prior to project implementation. A Class III survey (intensive inventory) means that pedestrian transects will be completed across the identified units with an interval of 20 meters between each survey transect. Intensive inventory is designed to identify any surface-visible heritage resources in the survey

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		area. Using a combination of Class I, II and III inventory strategies, the cultural resource surveys including previous cultural resource field inventories, and the 2011 field inventories of the project area were completed. All sites identified from previous cultural resource inventories and the 2011 inventories are noted in the Heritage section, p. 393. All sites will be avoided and/or site specific mitigation measures will be developed in consultation with the Montana State Historic Preservation Office prior to project implementation. Unplanned discoveries of heritage resources during project implementation shall cause project operations in the area of the discovery to cease until analysis and evaluation of the heritage resources are completed, including consultation with the Montana SHPO and appropriate Indian tribes (Forest Plan Standard 2). Heritage protection measures will be added to all appropriate contracts, sales documents, and special use permits (Forest Plan Standard 3).
Timber Harvest/Snag Retention/Pine Beatle Infestation		

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Timber Harvest		
Many adverse consequences to soil, ecological processes, wildlife, and other elements of the natural environment are associated with thinning. (Ercelawn, 1999; Ercelawn, 2000.) For example: "Salvage or thinning operations that remove dead or decayed trees or coarse woody debris on the ground will reduce the availability of forest structures used by fishers and lynx." (Bull et al., 2001.)	1 and 12	Douglas-fir and subalpine fir stands are identified in the DEIS as habitats currently suitable for fisher. Bull et al. (2001) is referenced in the fisher section of the DEIS.
Please define the amount of habitat loss that has already occurred in the project area due to past logging on public and private lands	3	Effects of past timber harvest on species habitats is addressed in the Wildlife section of the DEIS, p. 144.
Please define the review process that is completed in order to create openings larger than 40 acres. How are public concerns on this issue addressed in the NEPA process?	3	This process follows the direction provided from Forest Service Manual at 2471.1. In summary, the Forest submits to the Regional Forester a request to exceed openings larger than 40 acres prior to the decision for the NEPA analysis, provided the public has been notified and the environmental analysis supports the decision. The public comment period for the DEIS serves as public notification. In the request, reference is made to the relevant chapters in the environmental document (i.e. DEIS) that has evaluated all resources.
Trees killed by fire are worth much more to the forested ecosystem than preemptive timber harvest for goods and services to local communities.	4	Thank you for your comment. The Flint Foothills project does not involve harvesting fire-killed trees. The economic impacts are addressed in the Economic and Social Science section of the DEIS, p. 397.

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The natural resources harmed by commercial harvest are discussed in Opposing Science Attachment #1 *(see literature review)*. This harvest damage is an environmental effect and should be discussed in detail in Chapter 3 of the EA.	4	Literature cited in the Opposing Science Attachments is reviewed the Literature Review section, appendix B.
Designing a Commercial Timber Sale that Removes Mostly Lodgepole Pine is the Antithesis of Ecosystem Management Commercial removal of lodgepole pine is the first item listed in the P&N. Of course there are pockets of red LPP that is dead and dying. This is what's supposed to happen in healthy stands of LPP. Lodgepole pine is a native tree species in many areas of the west. It contains unique habitat for birds and mammals after it burns. Salvaging the dead and dying lodgepole pine not only destroys this post burn habitat but it inflicts damage to other resources as described in Opposing Science Attachment #1. The life cycle of lodgepole pine is dependent on fire. Without fire the serotinous cones of the species will not release their seeds. Without fire the lodgepole pine will cease to exist in the project area. Eradicating a species will rob the project area of its biodiversity. Taking action to simplify the forest is inconsistent with the ecosystem management policy of the Forest Service. Lodgepole will be killed by the beetles (like it should happen) or will die by using a chainsaw. The bug-killed LPP that's allowed to stand will fall to the ground and provide many resource benefits. The LPP that is salvaged will not provide these benefits. The act of salvaging the LPP will inflict damage to the site described in Opposing Science Attachment #1.	4	The mortality to lodgepole pine from mountain pine beetle is more extensive than pockets of dead trees. Additionally, the lifecycle of lodgepole pine does not always follow the path stated in this comment, although it is possible. Not all lodgepole pine that reaches the age of 80–90 years will be attacked by the mountain pine beetle since there are other factors to susceptibility besides age, including size, average phloem thickness, stand mean basal area, stand density index (Jenkins et al. 2007), elevation, and latitude (Amman et al. 1977). It is generally agreed that the mountain pine beetles are visually attracted to large diameter trees (in lodgepole pine, usually 8 inches d.b.h. and above), regardless of phloem thickness (Amman and Logan 1998). In addition, not all trees that are infested will die – sometimes there are unsuccessful attacks (pitchouts) and occasionally a portion of a tree is successfully infested and brood is produced without killing the tree (strip attack) (McGregor and Cole 1985).

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		While many lodgepole pine trees have serotinous cones that do need the heat of a fire for seed release and dispersal, lodgepole pine stands also regenerate after a mountain pine beetle epidemic without the need for a fire (Kaufmann et al. 2008). Serotiny is highly variable within the tree, among trees within stands, and among stands, varying from 0–85%, probably averaging less than 50% in the Northern Rocky Mountains of the United States (Lotan and Perry 1983). The serotinous cones on branches that have fallen near the ground are exposed to warmer temperatures than those found in the canopy and heat adequately through solar radiation to release seeds (Kaufmann et al. 2008, Hellum and Pelchat 1978, Kotok 1971). Seeds previously released from non-serotinous cones may exist in the existing seed bank in the forest litter, may continue to fall from the remaining live trees within the stands, and/or may blow in from live trees nearby (Kaufmann et al. 2008) as they are small and among the most dispersible of North American conifer seeds (Critchfield 1978). Therefore, as shown by the discussion above, the

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		commenter's summary that lodgepole pine would be eradicated from the project area through the proposed actions would not occur. In fact, the expectation that the harvest units will experience natural lodgepole pine regeneration within five years is well-supported by scientific literature, FACTS database queries, and many years of experience with this type of activity on the BDNF. FACTS database queries show that 94 percent of harvested stands reach the fully stocked certification standard of 200 trees per acre within the required 5-year period Approximately 1,100 acres (varies slightly by alternative) of approximately 18,000 acres (6% of the lodgepole pine acres) are proposed for salvage with clearcut treatments. This leaves about 17,000 acres or 94% of the lodgepole in the project area to continue to undergo natural processes without management. The purpose and need, DEIS, p.x. does not include attempting to prevent future mountain pine beetle infestations or to reduce chances of fire through salvage with clearcut. The citations provided by the commenter are addressed in the Literature Review section,

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		appendix B.
Never must beneficial processes in the forest be eliminated in order to enrich private entities financially! One of the needs stated in the P&N for lodgepole removal states: "salvage infested lodgepole pine to capture their product value before they deteriorate" This is inconsistent with the policy statements made public by Forest Service Associate Chief Sally Collins. "our focus today in the Forest Service is no longer on logging and road-building. In the last 5 years, for example, we decommissioned 14 miles of road for every mile of road added to our forest road system. And where we do cut timber, it is usually a byproduct of forest health projects-like cutting 14-inch white fir to protect giant sequoia groves." From a speech by Forest Service Associate Chief Sally Collins "Changing Public Land Uses: A Tale of Two Debates" Outdoor Writers Association of America, 76th Annual Conference Columbia, MO-June 17, 2003 http://www.fs.fed.us/news/2003/speeches/06/collins.shtml "Post-World War II, we entered a new period characterized by timber production. From the 1960s to the 1980s, every administration, with strong congressional support, called for more timber harvest from the national forests, with the goal of replacing the depleted stocks of private and state timber as a result of the war effort. We measured success largely in terms of producing timber and providing multiple uses, including outdoor recreation and fish and wildlife. In the early 1990s, that changed again. Today, we're in a new period focused primarily on ecological restoration and recreation. Maybe more than ever before, we are focusing on delivering values and services like clean air and water, scenic beauty, habitat for wildlife, and opportunities for outdoor recreation. Not only do Americans want these things from their national forests, but this shift is also essential to cope with some huge threats to the sustainability of these forests." (pp 8-9) Forest Service Associate Chief Sally Collins "The Future of Partnering with the Forest Service " A speech presented at the Annual Meeting of the National Association of Conservation Districts Atlanta, GA—February 8, 2005 http://www.fs.fed.us/spf/coop/library/NACDspeech.pdf The Perceived Advantages of Reducing Stand Density in order to "Check the Trend of Insect-Related mortality" is not Worth Inflicting Resource Damage to the Thinned Stands. Thinning is commercial timber harvest that uses the same equipment that removes larger trees. Thus, thinning damage is the same as commercial timber harvest resource damage. Trees killed by insect activity make important wildlife habitat. Dead and dying trees that are not hauled to the mill are not wasted trees. Indeed, leaving these trees standing provides habitat. When they fall they provide organic material to enrich the soil. Basing the treatment of conifer trees on the money they might provide to corporations that log or mill the trees is backwards. The trees should be harvested to benefit the many natural resources in the forest. The trees must not be harvested to benefit the corporate bottom-line.	4	The citations provided here are addressed in the Literature Review section, appendix B.
…but it is our feeling that removal of the trees in a timely manner addresses fire danger, economic needs of	5	Thank you for your comment. The

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the forest products industry, and the environmental health of the forest ecosystem. In short it is a win-win proposed action		economic impacts are addressed in the Economic and Social Science section of the DEIS, p. 397. Removal of trees may or may not make a difference in fire danger. Commercial harvest would provide for the economic needs of the forest products industry. The design of the project is intended to contribute to achievement of the following Forest Plan goals and objectives. Goals include managing lands suitable for timber production for the growth and yield of sawtimber, crop trees, pulpwood, and other forest products, including salvage harvest and use forest products to provide economic benefits where project objectives, forest plan objectives, and forest plan standards can be met. Objectives include bringing 10% of lands suitable for timber production into a managed condition and managing those stands already in a managed condition to maintain long term sustained yield.

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Ban all logging to cut a tree because there is a “risk” of infection is stupid. That would be like killing a person 128igante they “might” get sick. How ludicrous can this agency get? If you cut them down, how can they develop a natural 128igantean128 for 128igantean128. They can do that. If you cut them down, no one will ever know. What a stupid plan. I definitely think growing for “long term yield” makes this national site owned by national citizens into a lumberyard for local profiteers. You are changing the whole reason the taxpayers and citizens of this nation worked and slaved to save this site. And you are doing it for greed and money. 128igante is sinking into crap because of this fs focus.	8	Thank you for your comments
Please consider each of the many adverse effects that are directly caused by timber harvest activities. If the Responsible Official plans to accept some of this resource harm then please list the ham in the NEPA document and tell the public why the timber sale is important enough to accept such harm.	10	The environmental effects are described in Chapter 3 of the DEIS.
We also encourage use of timber harvest methods that minimize ground disturbance (e.g., skyline, helicopter, and logging during winter on snow or frozen ground), and inclusion of watershed rehabilitation activities such as road obliteration, road BMP upgrades, road drainage improvements, revegetation, stream and bank stabilization, and other watershed restoration activities as much as possible.	11	All harvest methods are being considered to meet Forest Plan standards for soil disturbance. The most economically efficient harvest methods will be utilized during treatment while maintaining Forest Plan standards. Project design features and mitigation measures are designed to address watershed conditions. Features/measures include road maintenance and reconstruction; BMPs; and road decommissioning, including obliteration, DEIS, p. 43.
Snag Retention and Recruitment		
We are concerned about the lack of any actual snag requirements in the BDFP. Please define exactly how many snags, if any, will be provided for in each harvest unit, or if snags will not actually be provided in these units but instead allotted to adjacent unlogged areas	3	Forest Plan snag standards require retention of snags within treatment units if an area-wide snag analysis has not been completed. No area-wide assessment has been completed for this project.

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Please discuss the current best science, or the Northern Region Snag Management Protocol, and how this science will be applied to the current project.	3	The best available science is applied in the Forest Plan. The Forest Plan provides the direction through Wildlife Standards for the Forest, and supersedes any other direction that was followed in the past within the Region or on the Forest. The application of the FP Standards is displayed in appendix C.
Forest thinning is known to reduce snag recruitment not only by reducing future snags via mortality, but it reduces snags as well by blowdown within thinned stands. It also reduces snags longevity because the larger snags are generally removed for commercial purposes. Please define how these cumulative impacts on snags will affect wildlife.	3	All large snags (> 20.0 inches d.b.h.) would be retained in treatment units (DEIS, p. 156). Commercial thinning treatments would decrease stand densities, thereby accelerating future tree growth. This would also reduce the potential for tree mortality due to insects and disease, wildfire, and growth suppression. While total snag numbers generated in a stand that has been thinned may be less than in a stand that has not been thinned, snags in the thinned stand are more likely to be larger and therefore more functional to a wider range of species (DEIS, p. 156).
We are concerned about the cumulative removal of current and future snag habitat from both past and planned logging, including on private lands. What is the overall loss of snag habitat for these wildlife species and how will this affect landscape viability	3	The DEIS describes the current low amount of snags within past harvest units. The DEIS describes that a large portion of forested stands would remain untreated within the project area. Conditions within these stands currently support snag availability.
Please define the specific effects of forest thinning on snag recruitment over time, including average snag	4	Thinning would likely have an

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size.		immediate reduction in some snags. Snags deemed to be a safety hazard during logging operations would have to be removed. However, with logging being totally mechanized (done by machines), snag hazards are not as common as past harvest methods. Prescribed fire within the units would create new snags that would likely be high quality snags (larger diameter) that would stand for a long period of time. Small snag recruitment due to stand dynamics associated with high stand density would be eliminated for a period of at least 50 years. Retaining existing snags to the extent possible would be part of the timber sale contracts, which would retain the current snag habitat. Providing large, fresh snags through the prescribed burning activities would provide potential future habitat (Harrod et al. 2009). The effects to snags by thinning would be over the acres proposed to be commercially thinned (alternative 2, 1149 acres; alternative 3, 666 acres); the remaining approximately 13,000 acres (out of 14,247 acres total, or 91%) of mid- to late seral Douglas-fir – ponderosa pine forests would not be affected.
What is the current availability of larger snags on the BDNF, and how will this project affect that availability?	4	Bush et al. (2006) estimated that the density of snags 10-19.9

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		inches d.b.h. was 6.7 per acre. The average density for snags 20.0 inches or greater d.b.h. was 0.4 per acre at the Forest level. Since then, these densities have likely increased due to insect-related tree mortality. The project would retain the large snag component by retaining snags larger than 15.0 inches d.b.h. per Forest Plan direction.
Please define what the expected reduction of snag habitat, including snag sizes, will be during project implementation	13	The effects to snags as a result of proposed treatments are described in the DEIS, p. 156.
Please define how snag recruitment will be achieved in clearcuts, and how snag recruitment will be affected by commercial thinning.	13	Snag recruitment in the salvage with clearcut units would be negligible. The lodgepole pine stands proposed for salvage are currently comprised of existing snags (recently dead lodgepole pine) or soon to be snags (dying lodgepole pine). About 1,100 acres (varies slightly by alternative) of approximately 8,500 acres of mid- to late seral lodgepole pine (13% of the mature lodgepole pine acres) are proposed for salvage with clearcut treatments. This leaves about 7,400 acres or 87% of the lodgepole in the project area to continue to provide snags.
How will this project affect the total lack of large snags over 20 inches dbh in the Flint Uplands landscape?	13	The project would retain the large snag component by retaining snags larger than 15.0 inches d.b.h. per Forest Plan direction.

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The Forest Plan implies that snag habitat will be monitored within project areas. Has this been done for this project, and how was it completed? How will the snag numbers after logging be measured?	13	The Forest Plan monitoring strategy shows that condition and trend of key characteristics of vegetation diversity, including snag numbers, would be monitored based on FIA national inventory and/or other local Forestwide or project level inventories. Inventory reporting is scheduled to occur every 5 years (Forest Plan, pg. 275). Within the Flint Foothills project area, existing snag numbers were assessed as part of stand exams conducted within proposed treatment units (DEIS, p. 156). Compliance with snag retention requirements would be monitored during harvest implementation.
Please define how snag management, including past logging losses of snags, was considered in the design of this project. Since all the past logging cannot mitigate the removal of snags, how is tins problem being addressed in the proposal	13	The DEIS describes the current low amount of snags within past harvest units. The DEIS describes that a large portion of forested stands would remain untreated within the project area. Conditions within these stands currently support snag availability. Forest Plan snag retention requirements would apply to proposed treatment units.
Pine Beetle Infestation		
Please define the published science that identifies an increase in fire risk as a result of pine beetle infestations.	3	There isn't a published scientific document that has the simple correlation of an increase in fire

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		risk as a result of pine beetle infestations. Jenkins et al (2007) is a recent specific assessment of these relationships, and concludes that bark beetles and their effects on fuel accumulations and subsequent fire hazard are poorly understood. Although bark beetles have a significant effect on fuels, weather conditions play an important role in the intensity and duration of fires (Jenkins et al 2007).
The scoping notice only defined the detrimental impacts of beetle infestations on timber production. However, the beneficial effects to many wildlife species were not noted. Please provide a balanced review of beetle infestation impacts on ecosystems.	3	Contributions of insect-related tree mortality to wildlife habitats are described in Wildlife section of the DEIS, p. 147 as summarized by Chan-McLeod (2006).
The act of salvaging the LPP will inflict damage to the site described in Opposing Science Attachment #1. If the insect activity is not within 1 mile of a WUI it should be left alone with 35,000 pound pieces of industrial machinery. Please allow this species to complete its life cycle. After the trees are dead the Mountain Pine Beetles have moved on. Salvage logging has no effect on the beetle population. See Opposing Science Attachment #17.	4	The purpose and need for this project, DEIS, p.x, and the subsequent proposal designs, are not designed to have an effect on the mountain pine beetle population. Literature cited in the Opposing Science Attachments is reviewed the Literature Review in appendix B
Insect activity is an indicator of a healthy forest. Please see *A Healthy Forest Needs Bugs (link in literature review; also see Opposing Science Attachment #5)*	4	Literature cited in the Opposing Science Attachments is reviewed the Literature Review section, appendix B.
Insect Activity is an Indicator of a Healthy Forest. This includes mountain pine beetle. Native insects have existed in our forests for thousands of years. Forests that have had insect activity are still healthy. Forests that have been manipulated to make money from this natural process are unhealthy.	4	The Vegetation analysis acknowledges the function of mountain pine beetle in the natural disturbance processes within the project area DEIS p. 67.

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		The analysis does not state the current health status of the forest (either the managed or unmanaged portions) within the project area (as either healthy or unhealthy). The Vegetation analysis does quantify the number of acres of pine affected trees from mountain pine beetle, DEIS, p. 68.).
Active timber management will maintain a diverse and dynamic forest providing quality habitat for wildlife species including native fish, and removal of trees that have succumbed to insect and disease infestations will provide a favorable environment for reestablishment of a healthy forest ecosystem on these sites. Allowing catastrophic levels of dead and dying trees to remain for an extended period does not promote healthy forests, does not embrace the principles of active resource management, and is counterproductive to meet ecologic, economic and cultural needs.	5	The purpose and need, DEIS p. 4, does not include managing for healthy forests, or managing for quality habitat for wildlife or fish habitat. The purpose and need does manage stand conditions, captures economic value of the wood product, creates early seral conditions, and reduces forest densities.
It is good to see a plan that will utilize some of the beetle killed trees.	7	Thank you for your comment.
Utilizing the dead trees will also be helpful to us in the long term since climbing through tangled deadfall after elk is not high on our list of things we like to do.	7	Thank you for your comment. Removal of dead trees is a key component of action alternatives and is a positive attribute to scenery as well as big game access. Downed wood from timber harvesting and tree thinning has a negative impact on scenic beauty. Removing dead wood or chipping onsite can greatly increase scenic ratings for tree thinning projects (Ryan, 2005).
There was also no analysis in the Forest Plan regarding the need to reduce insects. This strategy will eliminate habitat for many species. Objectives that do not look at potential impacts are arbitrary.	13	The project does not propose to reduce insects – that is outside of the stated purpose and need,

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		DEIS. p. x. Salvaging dead and dying trees would not reduce habitat for insects, as the trees impacted by mountain pine beetle have already served as hosts for the insects. About 1,100 acres (varies slightly by alternative) of approximately 8,500 acres of mid- to late seral lodgepole pine (13% of the mature lodgepole pine acres) are proposed for salvage with clearcut treatments. This leaves about 7,400 acres or 87% of the lodgepole in the project area to continue to provide insect habitat. There would also be a reduction of insect habitat through commercial thinning and seed tree harvest in lower elevation Douglas-fir and ponderosa pine habitat would reduce habitat for insects. Habitat for insects would be reduced over the acres proposed to be seed tree and thin harvest (alternative 2, 1502 acres; alternative 3, 1019 acres); the remaining approximately 13,000 acres (out of 17,000 acres total, or 75%) of mid- to late seral (pole through sawtimber) Douglas-fir – ponderosa pine forests would not be affected and available for insects.
Temporary Roads/Road Construction/Decommissioning/Restoration *Temporary Roads*		

Comment/Concern	Letter Number	Response to Comment How Comment was Addressed
Please define the long-term management plans for all the new temporary roads that will be built for this project. What will the total road density be before and after project completion? If the temporary roads will not be completely obliterated, this should be noted.	3	Road densities are disclosed in the transportation specialist report. They are as follows. Alt 1: before = 2.94 miles per square mile, during = 2.94, after = 2.94. Alt 2: before = 2.94, during = 3.06, after = 2.89. Alt 3: before = 2.94, during = 2.94, after = 2.90. All new temporary roads would be decommissioned by obliteration, following completion of the vegetation treatments that these roads access. Existing roads used as temporary roads for the vegetation treatments would also be decommissioned, although by a variety of rehabilitation methods. See table 6 in the description of the action alternatives for more information on specific decommissioning of existing open and closed unauthorized roads.
Please consider the following information: Sometimes temporary roads create more sediment per mile than system roads. This is because: 1) The earth must be handled twice when constructing and obliterating temp roads. 2) Temp roads are “designed” by a logger on a cat with no knowledge of hydrology and the logger is under pressure to work quickly. 3) Most temp roads are outsloped, thus, the water on the road drains off the road at random places. 4) Temp roads have no surfacing to slow the water velocity. High water velocity picks up more sediment particles. 5) Temp roads have no ditch. Ditches adjacent to system roads control the water until the road designer calls for an appropriate outlet culvert location. 6) Sediment-laden water leaves the temp road at random locations . . . often in the streams. Please read “Temporary Roads are Like Low Fat Ice Cream” by George Wuerthner, 3-17-09*. (see literature review)*	4	Project design features for temporary road construction to avoid drainage problems that can lead to increased sedimentation have been developed, DEIS, p. 43. Alternative 3 was developed to exclude new road construction. The selected alternative would utilize contract requirements for mitigation of resource damage related to temporary road construction and use, including addressing drainage concerns. The alternative descriptions,

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		DEIS, p. 13, in the Transportation section and the Transportation report in the project file included additional descriptions of road work.
Road Construction Damages the Proper Functioning of Several Natural Resources in the Forest … Primarily the Aquatic Resources The Foothills Vegetation Management project proposes to construct 7 miles of temporary road. For over a decade the agency has been telling the public that temporary road construction is benign. Some proposed timber sales actually exclude temporary road statistics in the road construction section of the ROD or DN.	4	Road management is extremely important for reducing the environmental effects of roads. Project design features for this project have been designed to prevent sedimentation from roads as a result of the project, DEIS, p. 43. The sedimentation from roads is disclosed in the Hydrology section of the DEIS, p. 263.
I like the fact that any new roads will be taken out when finished	7	Thank you for your comment.
For decades the forest service has stressed to the public that temporary roads are ecosystem benign because they will be obliterated after use. Of course this is untrue.	10	Please see response to Letters 1 and 4
Please discuss how many old logging roads will be used for the project, and why the 10 miles of additional temporary road that will be required for this project will not be used again in the future as well, for more logging. Aren't all these logging roads actually permanent roads that are used intermittently? Their impact needs to be fully assessed.	13	The description of road categories and proposed uses is provided in the description of the alternatives, DEIS, p. 13, To summarize, a combination of new and existing roads are proposed to implement vegetation treatments. Alternative 3 has been created that does not include any new roads, only proposing to utilize existing routes. Both alternatives include use of existing unauthorized routes for vegetation treatment access. Both of these alternatives would

Comment/Concern	Letter Number	Response to Comment How Comment was Addressed
		include decisions regarding the future management of these roads. In both alternatives, some would become permanent roads and managed under the Forest transportation system, while others would be temporarily used and decommissioned.
Road Construction/Decommissioning/Restoration		
Ban new roads	8	Thank you for your comment. The no action alternative and alternative 3 do not construct new roads.
The scoping package indicates that 10 miles of road will be constructed as part of the Proposed Action. Scientists know that road construction in the forest destroys the proper functioning of the natural resources.	10	Thank you for your comment. The environmental consequences in Chapter 3 of the DEIS address the effects of road construction on the resources For the action alternatives, impacts from roads are addressed in the applicable resource sections in Chapter 3 of the DEIS. Also, please see responses above to letters 1, 4, and 13
Please do not construct any roads (temp or system) for this sale. Of course there will be trees that cannot be harvested. This isn't as tragic as allowing harm to occur to the natural resources on public land.	10	Alternative 3 was developed exclude new system or temporary roads construction, DEIS, p. 32.
If this plea makes no effect on the Responsible Official and the roads for this project will still be constructed, then please include a section in the draft NEPA document listing the resource damage roads inflict on the forest by the roads.	10	Impacts from roads are addressed in the applicable resource sections in Chapter 3 of the DEIS.
We are losing about 200 square miles of our public land to development each week. There are over 400,000 miles of road in our national forests. That's enough to reach the moon and half way back.	10	Thank you for your comment.

Comment/Concern	Letter Number	Response to Comment How Comment was Addressed
Reductions in sediment transport to streams from roads often provides a good means of offsetting sediment production and transport associated with timber harvest and road construction activities. Roads are often major anthropogenic source of sediment that affect hydrology, water quality and fisheries in streams on public lands (e.g., road planning and design to minimize new roads; locate roads to minimize water quality and fisheries impacts; and improve the condition of roads with BMPs, realignment, and storage and decommissioning of roads).	11	Under the action alternatives, the proposed road maintenance activities would be accomplished in compliance with best management practices (BMPs) and other project design features, DEIS, p. 43.
We recommend minimization of new road construction to reduce adverse environmental effects, and locating roads to minimize effects to surface waters.	11	Under alternative 2, new road construction is proposed only in locations where the interdisciplinary team agreed on alignment. The applicable resource impacts have been analyzed and disclosed in the resource reports in the DEIS, Chapter 3.
The NOI states that the proposed action may include construction of approximately 10 miles of temporary roads and use of 72 miles of existing roads. We encourage minimization of new road construction as much as possible, particularly permanent new roads, and location of roads away from streams and riparian areas.		Alternative 3 was developed to exclude new road construction, DEIS, p. 32.
In anticipation of the road sediment reductions that will be called for in the upcoming TMDLs, the proposed project should seek to decrease sediment loads from forest roads. Please ensure that the Environmental Impact Statement (EIS) for the proposed project will assess road sediment load reductions associated with the proposed Best Management Practices (BMPs). The inclusion of road BMPs and decommissioning is very important and the WPS encourages this effort.	15	Under the action alternatives, the proposed road maintenance activities would be accomplished in compliance with best management practices (BMPs) and other project design features, DEIS, p. 43
We suggest that the Forest describe the current conditions of the road system, including an assessment of project area roads that do not meet forest road maintenance standards. We suggest that road restoration measures be included to address project area roads with significant water quality concerns, rather than limiting the project road restoration measures to only timber haul roads. Unless systematic project-area road restoration is implemented and road BMPs are maintained, sediment reduction benefits from haul road	15	Detailed information from road condition surveys on each project-related road is documented in the “road logs” in the Transportation section in the project file. The

Comment/Concern	Letter Number	Response to Comment How Comment was Addressed
restoration activities may be temporary, and may not provide improved water quality over the long term, especially for roads near streams and with stream crossings.		Transportation section in the DEIS, p. 105 has information on the type of road improvement and maintenance activities proposed. Appendix B of the Transportation Report in the project file has estimated route-specific work items based on the road condition surveys. The purpose and need, DEIS p.4. does not include project-area-wide road restoration. However, road maintenance and improvements are proposed where access to vegetation treatments are needed. The roads proposed for use would have maintenance performed in accordance with BMPs, in addition to other project design features, DEIS, p.43. While these improvements are only associated with the specific roads included in the project, the watershed benefits are still worthwhile.

Opposing Science Literature Review

The following table displays the Forest Service response to opposing science received during scoping.

Table B- 3. Literature suggested during scoping and the Forest Service responses

Letter Number	Literature
4	**Agee, J.K. 1994. "Fire and weather disturbances in terrestrial ecosystems of the eastern Cascades." USDA Forest Service. Gen. Tech. Rep. PNW-GTR-320. 52pp.** "Twentieth century forest management, for all its good intentions, has left a mess on the landscape." http://www.andykerr.net/GenForests/ForestFiretQuotes.html **Review: Relevant to the Project** *Although the quote above does not occur within the document, nor does the document imply that twentieth century forest management left a mess on the landscape. Rather, the document provides indepth analysis on disturbance processes in the eastern Cascades in the states of Oregon and Washington, with the primary focus being fire. The document does speak to the interruption of natural fire regime disturbances and their function in the varying vegetation communities with management practices in the twentieth century. In the assessment provided by the document, the findings are similar and supportive of what the Flint Foothill vegetation analysis provides, namely that the lack of natural fire has allowed a progression of higher densities and fewer early seral species, with the increase in insect mortality, and the best path to better management is to consider "ecological relations by climax series and plant association groups" in "understanding major processes and effects, and how each of them varies" (Agee 1994). "Ultimately, insect, disease, and fire hazards should be understood by climax series and these same or similar plant association groups" (Agee 1994).*
4	**Aguirre-Bravo, Celedonio and Carlos Rodriguez Franco, compilers 1999. "North American Science Symposium: Toward a Unified Framework for Inventorying and Monitoring Forest Ecosystem Resources." Guadalajara, Mexico (November 2-6, 1998). Proceedings RMRS-P-12. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station** "The general objective of this Symposium was to build on the best science and technology available to assure that the data and information produced in future inventory and monitoring programs are comparable, quality assured, available, and adequate for their intended purposes, thereby providing a reliable framework for characterization, assessment, and management of forest ecosystems in North America." http://www.fs.fed.us/rm/pubs/rmrs_p012.html **Review: Not Relevant to the Project** *This symposium was a compilation of inventory and assessment approaches (views) from the three North America countries (Canada, United States and Mexico), with the recommendation that the three countries prepare continental wide forest assessments on concerns of common*

Letter Number	Literature
	interest.
4	**Al-jabber, Jabber M. 2003 "Habitat Fragmentation: Effects and Implications."** "Fragmentation has been considered as one of the most major factors that lead to the decline of many wildlife species (Brittingham and Temple 1983, Yahner 1988, Winslow et al. 2000) because fragmentation tends to decrease population productivity (Robinson et al. 1995). Therefore, Meffe states that "fragmentation has become a major subject of research and debate in conservation biology" (Meffe et al. 1997, p. 272). Forest fragmentation usually occurs when large and continuous forests are divided into smaller patches as a result of road establishment, clearing for agriculture, and human development (Robinson et al. 1995, Meffe et al. 1997)." (Pg. 1) "Generally, habitat fragmentation is an ecological process in which a large patch of habitat is divided into smaller patches of habitats. Usually, this process is caused by human activities (roads, agriculture, and logging). It also reduces the value of the landscape as habitat for many species (plants and animals). Fragmentation alters natural habitat in many ways, including reduction of patches' sizes, increment of distances between similar patches, and increment of edges and predation (Brittingham and Temple 1983, Robinson et al. 1995)." (Pp. 2 and 3) **Review: Relevant to the Project** *This unpublished, non-peer reviewed paper summarizes the general effects of habitat fragmentation. General concepts from this paper, including the effects of large openings, have been incorporated into the wildlife section of the DEIS, and in species-specific analyses where appropriate. Traditionally, fragmentation has referred to forest where there has been a permanent forest loss due to agricultural conversion, urban expansion or other permanent development. In this case, we are referring to fragmentation in managed forest landscapes where stands of mature trees are interspersed with dead and dying stands, and younger-aged stands. As noted in Samson (2006), Gallant et al. in the Greater Yellowstone Ecosystem found "the primary forest dynamic in the study area is not the fragmentation of conifer forest by logging, but the transition from a fire-driven mosaic of grassland, shrubland, aspen and mixed forest to a conifer-dominated landscape (Forest Plan FEIS, pg. 899). The Forest Plan vegetation goals, objectives and standards were developed based on historic vegetation patterns and size class structure. The assumption was made that maintaining historic patterns and size class structure will maintain habitats for wildlife species that evolved and are adapted to local habitat conditions (Forest Plan FEIS, pg. 473).*
4	**Amaranthus, Mike P. Ph.D., Raymond M. Rice Ph.D., N. R. Barr and R. R. Ziemer Ph.D. "Logging and forest roads related to increased debris slides in southwestern Oregon." Journal of Forestry Vol. 83, No. 4. 1985.** "Debris slides over a 20-year period were inventoried on 137,500 acres of forested land in the Klamath Mountains of southwest Oregon. Frequency during the study period was about one slide every 4.3 years on each 1,000 acres-an erosion rate of about 1/2 yd3 per acre per year. Erosion rates on roads and landings were 100 times those on undisturbed areas, while erosion on harvested areas was seven times that of undisturbed areas. Three-quarters of the slides were found on slopes steeper than 70 percent and half were on the lower third of slopes." "Soil erosion rates due to debris slides were many times higher on forests with roads, landings, and logging activity than on undisturbed forests." http://www.fs.fed.us/psw/publications/ziemer/Ziemer85.pdf

Letter Number	Literature
	Review: Relevant to the Project *This paper reviews landslide frequency as affected by forest management in the coastal mountains of Southwest Oregon. The authors found a six-fold increase in landslide volume in Forest Service-logged areas compared with unharvested areas, as well as erosion rates that were 100 times greater on roads and landings compared with undeveloped areas. The study area geomorphology and climate are completely different from that of the Flint Foothills project area. Most important to note, however, is the fact that no landslides have been found within the project area. The DEIS acknowledges the effects of roads on erosion (sedimentation). These effects are disclosed in the DEIS in the Hydrology section. Additionally, mitigation measures to address erosion from roads is prescribed and discussed in the DEIS.*
1	**Ament, Robert. 1997. "Fire Policy for the Northern Rocky Mountains (U.S.A.)." Publisher not available with article.** "Continued mismanagement of national forest lands and FS refusal to fully implement the Fire Policy puts wildland firefighters at risk if and when they are dispatched to wildfires. This is a programmatic issue, one that the current Forest Plan does not adequately consider. Please see Ament (1997) as comments on this proposal, in terms of fire policy and Forest Planning." www.landsinfo.org/ecosystem_defense/Science_Documents/Ament_1997.doc **Review: Not Relevant to the Project** This is an opinion piece and not a peer reviewed scientific paper on the failure of fire suppression and prevention policies and the need to have a strategic fire suppression approach in the Northern Rockies. The author claims that the current prescribed fire policy is ineffective for reducing wildlfires and that the prescribed natural fire policy is underutilized. It concludes with recommendations for future actions with respect to fire suppression and preventions actions. The Flint Foothills project does not include an objective to reduce fuels. Rather, prescribed burning is proposed to create a mosaic of age classes and reduce stand density to meet Forest Plan objectives.
4	**Atcheson, David. "Clearcuts and Corporate Welfare: Sweetheart land deals and bailouts hide the true cost of corporate logging." Washington Free Press, July/August, 1996.** "In June of 1995, Essential Information, together with the CATO Institute and the Progressive Policy Institute, released a Dirty Dozen list of federal subsidies to cut from future budgets. The groups recommended the elimination of the Forest Service road construction budget to curb sales of timber from public lands to private companies. Cutting the road budget would save roughly $600 million over five years." http://wafreepress.org/22/Timber.html **Review: Not Relevant to the Project** *This opinion paper provides some background on an outdated financial accounting system that is not pertinent to the Flint Foothills economic analysis. Costs and revenues resulting from the various alternatives for Flint Foothills have been considered and displayed in the Economics section of the DEIS.*
4	**Babbitt, Bruce (DOI Secretary) and Dan Glickman (USDA Secretary) "A Report to the President in Response to the Wildfires of 2000"**

Letter Number	Literature
	September 8, 2000 "Notably, the Administration's wildland fire policy does not rely on commercial logging or new road building to reduce fire risks and can be implemented under its current forest and land management policies. The removal of large, merchantable trees from forests does not reduce fire risk and may, in fact, increase such risk. Fire ecologists note that large trees are "insurance for the future – they are critical to ecosystem resilience."10 Targeting smaller trees and leaving both large trees and snags standing addresses the core of the fuels problem.11 The Congressional Research Service (CRS) recently addressed the effect of logging on wildfires in an August 2000 report and found that the current wave of forest fires is not related to a decline in timber harvest on Federal lands. From a quantitative perspective, the CRS study indicates a very weak relationship between acres logged and the extent and severity of forest fires. To the contrary, in the most recent period (1980 through 1999) the data indicate that fewer acres burned in areas where logging activity was limited." http://www.forestsandrangelands.gov/resources/reports/documents/2001/8-20-en.pdf#xml=http://na.fs.fed.us/cgi-bin/texis.exe/Webinator/search/xml.txt?query=babbitt%2C+glickman&pr=HFR&prox=page&rorder=500&rprox=500&rdfreq=500&rwfreq=500&rlead=500&sufs=0&order=r&cq=&id=4c60c0b7e0 **Review: Not Relevant to the Project** *The citation is a congressional report that summarizes a Congressional Research Service study of the effects of logging on wildfire risk. The Flint Foothills Project purpose and need does not include a reduction in wildfire risk.*
4	**Barnard, E. L. Ph.D. "Forest Health Fundamentals" from Forest Management, 4004.** "Defining forest health has proven to be something akin to shooting at a moving target. Different groups and different folks often mean different things when they use the term. Attempts to formulate a standard "one size fits all" definition have occupied untold hours of bureaucratic, professional and academic meetings, and consensus remains elusive. Why? To begin with, when we talk about forest health, it is necessary to identify the scale of our focus. Are we talking about a pine plantation, a particular forest ownership, a county, a state, a region, etc.? Such scale is not always defined, and is often prioritized differently by different people for varying reasons. Another reason seems to be that one's concept of "healthy" is often inextricably linked to what he or she desires from the forest. What may be undesirable to forest managers emphasizing timber production may well be desirable to others interested primarily in wildlife habitat or biodiversity, and vice versa." http://www.fl-dof.com/forest_management/fh_fundamentals.html **Review: Not Relevant to the Project** *The main question posed by this reference is whether or not Florida's forests are healthy. The whole discussion on forest health by this reference occurs in a completely different forest type and does not address the forest conditions in the Flint Foothills project area. In addition, there is no reference to forest health in the Flint Foothill project analysis because the project is not addressing forest health, but rather responding to conditions created by the mountain pine beetle epidemic.*
4	**Barry, Glen, Ph.D. "Commercial Logging Caused Wildfires" Published by the *Portland Independent Media Center*, August 2002.**

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	"The biggest ecological con job in years is being waged by the U.S. Republican party and their timber industry cronies. They are blaming the recent Western wildfires on environmentalists, and assuring the public that commercial logging will reduce the risk of catastrophic wildfires." http://portland.indymedia.org/en/2002/08/17464.shtml **Review: Not Relevant to the Project** *The citation is an opinion piece on the effects of logging on wildfire risk. The Flint Foothills project purpose and need does not include a reduction in wildfire risk.*
4	**Barry, Glen Ph.D. "Insect Attacks May Benefit Colorado Forests" Forests.org, January 29, 2004.** "Forests change. Disturbance including insects and fires are frequently part of the regenerative process. Rarely is it possible or desirable to maintain a forest at some seemingly idyllic stage of succession. Forest health – including services provided such as water – require managing to maintain natural processes. In the overgrown western U.S., fires and insects are resetting the system in response to years of fire suppression and changing climate. They are doing so in a way that will lead to adaptive and renewed forests, with far improved outcomes than logging could ever hope to achieve. Bush's "Forest Health" initiative will only exacerbate the negative situation. These forests are still extensive and large enough that letting them be is the best forest health prescription." http://forests.org/blog/2004/01/insect-attacks-may-benefit-col.asp **Review: Not Relevant to the Project** *This is a blog responding to an article published by the Associated Press on the unprecedented insect outbreak in Colorado that was outlined in the state's annual forest report. The Flint Foothills project and greater area in Montana are experiencing similar insect infestations, though the insect and tree species differ from that in Colorado's annual report. The opinion expressed by the blogger appears to be targeting the Health Forest Initiative/Healthy Forest Restoration Act, which are focused on fuels reduction. The purpose and need for the Flint Foothills project is does not include an objective to reduce fuels.*
4	**Barry, John Byrne. "Stop the Logging, Start the Restoration" from *The Planet newsletter* June 1999, Volume 6, Number 5** "According to a 1998 poll by a firm that has worked for several Republican House members and two presidents, 69 percent of Americans oppose commercial logging on federally owned land. The Forests Service's own poll showed that 59 percent of Americans who expressed an opinion oppose timber sales and other commodity production in national forests." "Many Americans are surprised to learn that logging is even allowed on public lands. Alas, it has been since the Organic Act of 1897 first authorized logging in America's new forest reserves. That legislation called for watershed protection and a steady supply of timber – what the Forest Service calls 'multiple use.' " "But the agency has been unable to balance those goals. More often than not, the integrity of the forest ecosystem has been sacrificed to maximize timber and other commodities. And at taxpayer expense, notes Bernie Zaleha, chair of the End Commercial Logging on Federal Lands (ECL) campaign. The Forest Service lost $2 billion on its logging program from 1992 to 1997, according to the General Accounting Office. It spends more

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	on building roads and preparing sales than it gets back in timber receipts." http://www.sierraclub.org/planet/199905/ecl1.asp **Review: Relevant to the Project** *This is an article that alludes to a national survey, though not specific to the Flint Foothills Project. Local and national surveys from the past 30 years are presented in the Economics section of the DEIS to show a range of public sentiment on forest management.*
4	**Bartuska, Dr. Ann. Deputy Chief for Research and Development, USDA Forest Service, before the House Resources Forest and Forest Health Subcommittee July 15, 2004. (Excerpt from testimony)** "Forest Service managers strive to use the best science available in their decision making." http://www.fs.fed.us/congress/108/house/oversight/bartuska/071504.html **Review: Not Relevant to the Project** *The testimony is given in the context of restoring forests after catastrophic events, specifically wildfires, not directly referencing the Flint Foothills Vegetation Management Project. The mountain pine beetle infestation affecting the Flint Foothills area has not been deemed a "catastrophic event" though it is the largest and most severe in recorded history. It does not involve emergency stabilization and rehabilitation treatments following a fire. The testimony is not directly relevant to the project. With respect to "the best science available" the project considers the latest and best science available; more than 100 references are cited in the analyses.*
4	**Beschta, Robert L. Ph.D. et al. 1995 "Wildfire and Salvage Logging: Recommendations for Ecologically Sound Post-Fire Salvage Management and other Post-Fire Treatments on Federal Lands in the West"** "In view of the extent and persistence of human disturbance throughout forest and watershed ecosystems, continuing to simply manage fire risk without controlling the adverse effects of logging, grazing, road building, and mining is unsound resource management; it is an approach that without careful thought could lead to further damage rather than to the intended goal of protecting forest and stream health, as such an approach addresses the symptoms rather than the causes." "We need to accept that in many areas throughout the region, past forest management may have set the stage for fires larger and more intense than have occurred in at least the last few hundred years." http://www.saveamericasforests.org/congress/Fire/Beschta-report.htm **Review: Not Relevant to the Project** *This project is not in a recently burned area nor is it a fire salvage sale. This commentary was written by a group of scientists intending to help guide the policy debate concerning salvage logging in post-wildfire watersheds. The authors present several scientific principles and practices that are directed at promoting ecological recovery from wildfire events. The paper describes several areas and situations where the authors believe that*

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	salvage logging disrupts ecologic recovery in burned watersheds. *Beschta et al. provide findings and recommendations for fire management and salvage logging. In general, they find that natural recovery is a better path to ecologic recovery than management intervention. They reason that species in fire adapted ecosystems have the ability to recover from wildfires, and that historic and continued human intervention only retards the ecological recovery process. The authors list several recommendations on post-fire actions.* *This paper is not focused on specific ecological, social or economic characteristics of the Flint Foothills project area or specific goals or objectives of the Beaverhead-Deerlodge National Forest Plan.*
4	**BC Forest Facts. 2003. "Wildfire in British Columbia." September.** "Wildfire is a natural part of most ecosystems across British Columbia. It helps to renew the forest, maintain the diversity of plant and animal life, and keep insects and disease in check. It opens up dense forest to allow the growth of shrubs and grasses, creating browse for deer, moose, elk and other animals. It releases nutrients locked in slowly decaying logs." http://www.llbc.leg.bc.ca/public/PubDocs/bcdocs/364421/wildfire_bc.pdf **Review: Relevant to the Project** *This fact sheet from British Columbia talks about the role of wildfire in creating forest conditions and includes a discussion on the important of prescribed fire in managing forests. The Flint Foothils DEIS discusses fire as an important disturbance agent and proposes prescribed fire as a tool to achieve desired conditions. The content of the fact sheet is relevant, however not referenced in the analysis.*
4	**Bio-Medicine.org, 2001. "View of forest insects changing from pests to partners"** **Science Blog** "Beyond that, these insect attacks are actually nature's mechanism to help restore forest health on a long-term basis and in many cases should be allowed to run their course, according to Oregon State University scientists in a new study published this week in the journal Conservation Biology in Practice. Native insects work to thin trees, control crowding, reduce stress and lessen competition for water and nutrients, the researchers found. Some levels of insect herbivory, or plant-eating, may even be good for trees and forests, and in the long run produce as much or more tree growth. 'There is now evidence that in many cases forests are more healthy after an insect outbreak,' said Tim Schowalter, an OSU professor of entomology. 'The traditional view still is that forest insects are destructive, but we need a revolution in this way of thinking. The fact is we will never resolve our problems with catastrophic fires or insect epidemics until we restore forest health, and in this battle insects may well be our ally, not our enemy.' " http://news.bio-medicine.org/biology-news-2/View-of-forest-insects-changing-from-pests-to-partners-8940-1/ http://www.scienceblog.com/community/older/2001/C/200113890.html

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	Review: Not Relevant to the Project *The first link accesses a news – flash article, while the second accesses a blog; neither provided access to the full scientific report. From what could be accessed the discussion is focused on Pacific Northwest forests, and speaks to the benefits of insects to thinning forests. The current mountain pine beetle epidemic is not thinning the forests, rather is killing 5 inch and larger pine trees over the project area, with 100 percent of the pine (lodgepole, whitebark, and ponderosa) stands affected by mountain pine beetle. At endemic levels, the insect activity acts as the article indicates; however, the project area is part of a larger epidemic of mountain pine beetle.*
4	**Black, S.H. Ph.D. 2005. "Logging to Control Insects: The Science and Myths Behind Managing Forest Insect "Pests." A Synthesis of Independently Reviewed Research. The *Xerces* Society for Invertebrate Conservation, Portland, OR.** "Pine beetle suppression projects often fail because the basic underlying cause for the population outbreak has not changed (DeMars and Roettgering 1982). Typically, if a habitat favorable to high populations of western pine beetle persists, suppression—by whatever means—will probably fail. In summary, once bark beetles reach epidemic levels and cause extensive tree mortality, treatments aimed at reducing densities of the beetles are futile (Wood et al. 1985). Logging can also lead to heightened insect activity. Soil and roots can be compacted following logging, leading to greater water stress. Soil damage resulting from logging with heavy equipment can increase the susceptibility of future forests to insects and disease (Hagle and Schmitz 1993, Hughes and Drever 2001). Salvage logging after insect outbreaks also can make matters worse by removing snags, parasites, and predators from the forest system (Nebeker 1989). Outbreaks could then be prolonged because of a reduction in the effectiveness of natural enemies (Nebeker 1989). Standing dead trees are important for several birds that feed on mountain pine beetles; these birds are important regulators of endemic beetle populations that keep the risk of epidemics down (Steeger et al. 1998). Widespread removal of dead and dying trees eliminates the habitat required by bird species that feed on those insects attacking living trees, with the result that outbreaks of pests may increase in size or frequency (Torgerson et al. 1990). Logged stands have less diverse architecture and overall lower seed production than untouched stands. Consequently, logged stands have lower arthropod and small mammal diversity than undisturbed stands (Simard and Fryxell 2003). Mass annihilation of wood-decaying macrofungi and insect microhabitats from logging has an extremely detrimental effect on arthropod diversity (Komonen 2003), including on the natural enemies of pest insects. Sanitation and salvage logging differ from natural disturbance in their effects and tend to decrease habitat complexity and diversity, which can lead to an increase in insect activity (Hughes and Drever 2001). Large-scale efforts for beetle control are economically and ecologically expensive, and the uncertain benefits of control efforts should be weighed carefully against their costs (Hughes and Drever 2001). Former U.S. Forest Service Chief Jack Ward Thomas, in testimony before the U.S. Senate Subcommittee on Agricultural Research, Conservation, Forestry, and General Legislation on August 29, 1994, acknowledged that "the Forest Service logs in insect-infested stands not to protect the ecology of the area, but to remove trees before their timber commodity value is reduced by the insects." http://www.xerces.org/wp-content/uploads/2008/10/logging_to_control_insects.pdf

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	Review: Relevant to the Project *The conclusion of this citation is that "logging is not the solution to forest insect outbreaks" and "some amount of insect activity is inevitable…and epidemics of these agents are increasingly recognized as symptoms of, not reasons for, poor forest health. Rather than combat insects as pests, we should view their population swings as indicators of changing conditions in these forests and seek to address the underlying causes." This analysis does consider that the current beetle epidemic and budworm populations are cyclic in conifer stands in the project area, and are an indication of an adequate supply of suitable hosts within the Forest. The analysis does not consider logging as a solution to the forest insect outbreak, rather is a response to the changes in the forest because of the insects.*
4	**Black, Scott Hoffman Ph.D., Entomologist/Ecologist and Executive Director, "Logging to Control Insects: The Science and Myths Behind Managing Forest Insect 'Pests'" The *Xerces* Society for Invertebrate Conservation 2005.** "Insects, including those that feed on and sometimes kill trees, are integral components of healthy forest ecosystems. They help decompose and recycle nutrients, build soils, maintain genetic diversity within tree species, generate snags and down logs that wildlife and fish rely on, and provide food for birds and small mammals. Although insects have been a part of the ecology of temperate forests for millennia, many in the timber industry see them only as agents of destruction. Some foresters believe the solution to the problem is increased logging. A review of over three hundred papers on the subject reveals that there is little or no evidence to support this assumption. There is an urgent need for federal and state agencies and land managers to reevaluate their current strategy for managing forest insects—which often relies on intensive logging—and to adopt a perspective that manages for forest ecosystem integrity." http://www.xerces.org/guidelines-logging-to-control-insects/ **Review: Relevant to the Project** *The conclusion of this citation is that "logging is not the solution to forest insect outbreaks" and "some amount of insect activity is inevitable…and epidemics of these agents are increasingly recognized as symptoms of, not reasons for, poor forest health. Rather than combat insects as pests, we should view their population swings as indicators of changing conditions in these forests and seek to address the underlying causes." This analysis does consider that the current beetle epidemic and budworm populations are cyclic in conifer stands in the project area, and are an indication of an adequate supply of suitable hosts within the Forest. The analysis does not consider logging as a solution to the forest insect outbreak, rather is a response to the changes in the forest because of the insects.*
4	**Black, Scott Hoffman Ph.D., Entomologist/Ecologist and Executive Director, The *Xerces* Society Excerpt from a 2008 comment letter to Alice Allen, Hell Canyon Ranger District, Black Hills National Forest.** "Mountain pine beetles, Ips beetle species, red turpentine beetles, and other wood boring beetles are all naturally occurring insects on the Black Hills, yet the USFS perceives these insects as a threat to the Forest ecosystem. These insect species do diminish the cash value of some conifers. Accordingly, concerted efforts have been made to rid public forests of what are called "pest insects". However, such a strategy is not wise or

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	feasible. Insects including those mentioned above are integral components of healthy forest ecosystems. These native species do less damage to the forest than the commercial logging program (which completely removes trees and nutrients from the ecosystem). In addition, these insect species are invaluable to the BHNF forest ecosystem. Insects help decompose and recycle nutrients, build soils, maintain genetic diversity within tree species, generate snags and down logs required by wildlife, and provide food to birds and small mammals. By feeding upon dead or dying trees, wood borers and bark beetles provide food to insect gleaning species of birds (such as the black backed woodpecker which is listed as a MIS species on this Forest), create snags that may be utilized by cavity nesting birds in the future and overall are invaluable catalysts in forest evolution – often aiding immensely in the regrowth of forest after fires, blowdowns or other naturally occurring stand removing processes. The potentially significant direct, indirect, and cumulative impacts upon insects and upon the niche of insects in the BHNF forest ecosystem should be thoroughly analyzed in the FEIS." http://www.xerces.org/wp-content/uploads/2008/09/black_hills_comments.pdf **Review: Not Relevant to the Project** *This reference is from a comment letter to a project on the Black Hills National Forest. Much of the comment letter is an offering of opinion on a forest type that does not occur on the Beaverhead-Deerlodge NF. Where the comment letter references specific science, the references are concerning Ips pini (pine engraver) and seven different species of land snails. Neither the pine engraver nor any of the seven different species of land snails are an issue in the Flint Foothills Project area.*
4	**Black, S. H. Ph.D., D. Kulakowski Ph.D., B.R. Noon Ph.D., and D. DellaSala Ph.D. 2010. "Insects and Roadless Forests: A Scientific Review of Causes, Consequences and Management Alternatives." National Center for Conservation Science & Policy, Ashland OR.** "Even forest thinning, which is widely promoted as a solution by reducing tree susceptibility to outbreaks, has had mixed results and is unlikely to stem bark beetle epidemics on a large landscape scale, especially during drought cycles. Further, this type of thinning would not be a one-time treatment, but would require regular thinning of all treated stands every decade or so because thinning tends to promote rapid growth of understory vegetation, making it a potential fuel ladder. Moreover, too much thinning can moderate stand climates, which may be favorable to some beetles, and increase wind speeds adding to crown fire spread." "Scientists, land managers and residents of Colorado are concerned about how wildfire might affect our forests and communities. If the goal is to protect communities, fire-mitigation efforts should be focused around those communities and homes, not in remote and ecologically valuable areas." "These forests may look different to us, but beetle-affected forests are still functioning ecosystems that provide food and shelter for animals, cool clear water for fish and humans, and irreplaceable refuges for wildlife from the effects of logging, road building and climate change." (Pp 23 and 24) http://www.geosinstitute.org/images/stories/pdfs/Publications/RoadlessAreas/FireandBugReport.pdf **Review: Not Relevant to the Project** *This paper addresses the proposal to exempt national forest roadless areas in Colorado from protections under the 2001 Roadless Area*

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	Conservation Rule, in part to address insect outbreak and perceived fire risk in these forests. While several findings (1, 2, and 8) apply to the Flint Foothills project, the Flint Foothills project is in Montana and not in a roadless area. The Flint Foothills project does not purport to stem bark beetle epidemics on a large landscape scale through forest thinning in forest types that Colorado has (lodgepole pine).The thinning proposed with the Flint Foothills Project is limited to thinning of Douglas-fir and ponderosa pine stands, and is designed to reduce stand densities to maintain or improve resilient forest conditions (per Forest Plan objectives, FP pg. 43).The remainder of the proposal is salvage harvest of already dead lodgepole pine. It does not propose to affect wildfire, either in a general forest setting or adjacent to homes or communities. The proposal affects 6 percent of the project area with harvest activities, retaining over 94 percent of the project area as "refugia for wildlife from the effects of logging, road building and climate change."
4	**Board on Agriculture. 1998 "Forested Landscapes in Perspective: Prospects and Opportunities for Sustainable Management of America's Nonfederal Forests"** "The definition of forest health is continually being reevaluated. For instance, where once forest fires and insect infestations were seen as indicators of unhealthy forests, and thus great effort was made to suppress them, forest landowners and managers today are appreciating the long-term contributions that these conditions can make to a healthy ecosystem. It may be said that the standards by which we measure forest health are determined by the objectives we aspire to. Forests managed for maximum timber yield will require different criteria for judging forest health than those managed for old-growth forest purposes. Likewise, the health of forests adjacent to or in urban communities will be judged with criteria that are quite different from those used to judge forests in rural areas where population densities are quite low." http://www.nap.edu/catalog.php?record_id=5492 **Review: Not Relevant to the Project** *The link provided accessed executive summary of the aforementioned book Forested Landscapes in Perspective: Prospects and Opportunities for Sustainable Management of America's Non-Federal Forests. The summary and book address the role and importance of forests of other ownerships with respect to the goods and services they provide and the role the federal government has in promoting sound forestry on lands of other ownership. The Flint Foothills project is on National Forest Systems land.*
4	**Bond, Monica L., Derek E. Lee, Curtis M. Bradley and Chad T. Hanson "Influence of Pre-Fire Tree Mortality on Fire Severity in Conifer Forests of the San Bernardino Mountains, California" *The Open Forest Science Journal*, 2009, 2, 41-47.** "These results indicate that widespread removal of dead trees may not effectively reduce higher-severity fire in southern California's conifer forests. We found that sample locations dominated by the largest size class of trees (>61 cm diameter at breast height (dbh)) burned at lower severities than locations dominated by trees 28-60 cm dbh. This result suggests that harvesting larger-sized trees for fire-severity reduction purposes is likely to be ineffective and possibly counter-productive." (Pg. 1) "We found that stands with recent high pre-fire tree mortality due to drought and insects did not burn at higher severity in coniferous forests of the San Bernardino Mountains, southern California, in the two fires we examined. Pollet and Omi [32] reported anecdotally that stands of lodgepole pine (P. contorta) that experienced an insect epidemic in the 1940s in Yellowstone National Park burned at lower severities compared to adjacent burned areas in the 1994 Robinson Fire. A widespread low-severity fire in subalpine forests in the White River National Forest, Colorado did not

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	burn any beetle-affected stands [13]. Further, Bebi et al. [12] found that stands of Engelmann spruce (Picea engelmannii) and subalpine fir (A. lasiocarpa) in the White River National Forest influenced by a spruce beetle outbreak in the 1940s did not show higher susceptibility to 303 subsequent forest fires that burned after 1950." (Pgs. 45 and 46) http://www.biologicaldiversity.org/publications/papers/Bond_et_al.pdf **Review: Not Relevant to the Project** *The Flint Foothills project does not propose to remove dead trees to reduce fire severity.*
4	**M. Borga, F. Tonelli, G. Dalla Fontana and F. Cazorzi. 2003. "Evaluating The Effects Of Forest Roads On Shallow Landsliding" Geophysical Research Abstracts, Vol. 5, 13312, 2003c European Geophysical Society 2003.** "Plot-level studies have demonstrated the ability of forest roads to intercept and route both subsurface and surface overland flow more efficiently to the stream network. Significant amount of subsurface throughflow can be intercepted by the road, as a function of the road cut depth and the current saturation deficit, and then redirected, concentrating the flow in particular areas below the road. Road drainage concentration increases the effective length of the channel network and strongly influences the distribution of erosional processes. The concept of wetness index has been used in the study as a surrogate for subsurface throughflow, and the effect of forest roads on subsurface throghflow rerouting has been assessed by evaluating the changes in terms of draining upslope areas. A threshold model for shallow slope instability has been used to analyse erosional impacts of drainage modifications. In the model, the occurrence of shallow landsliding is evaluated in terms of drainage areas, ground slope and soil properties (i.e., hydraulic conductivity, bulk density, and friction angle). The model has been used to generate hypotheses about the broader geomorphic effect of roads. Modelling results have been compared with available field data collected in north-eastern Italy." http://www.cosis.net/abstracts/EAE03/13312/EAE03-J-13312.pdf **Review: Relevant to the Project** *This article looks at the effects of roads on increasing shallow landslides. The study incorporates a conceptual model of the effect of forest roads on hillslope soil moisture and runoff generation into a hydro-geomechanical model for slope instability due to shallow landsliding. There were no observed shallow landslides in the project area from road failures. This article does explore the idea that hillslope soil moisture increases from roads could lead to future slope instability and channel network drainage extension from roads. BMPs will be used on roads used for this project that are demonstrated to be effective at reducing sediment derived from roads, and reducing the amount of connectedness between roads and streams.*
4	**Bosworth, Dale N. Chief USDA Forest Service, on Sustainable Management of the National Forests, at the Andrus Center for Public Policy, Boise State University December 12, 2001. (Excerpt from a speech)** "The American people have come to expect us to use the best science, and we ought to use the best science." (pg.4) http://www.andruscenter.org/images/transcripts/Sustainable_transcript.pdf

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	Review: Relevant to the Project *In Chief Bosworth's speech, not directly referencing the Flint Foothills Vegetation Management Project, the statement to use the best science was made in the context of the processes that are required for the Agency to make decisions. He states that the process can get bogged down and become a vicious cycle, making it difficult to make sustainable decisions. The Flint Foothills project analyses cite over 100 peer reviewed scientific documents used in the analysis.*
4	**Bosworth, Dale. Chief, USDA Forest Service, before the Committee on Energy and Natural Resources United States Senate March 3, 2004. (Excerpt from a statement)** "We are committed to accomplishing the aggressive treatments planned in the President's Budget for FY 2005 using new authorities in the Healthy Forests Restoration Act that improve the condition class of the nation's watersheds and thus protect communities and resources for future generations, and our Research Station directors are committed to providing the Forest Service with the best science available." http://www.ourforests.org/fact/bosworthtestimony0304.pdf **Review: Not Relevant to the Project** *This is from a speech Chief Bosworth gave to the Interior and related agencies appropriations subcommittee for the 2005 fiscal year budget request for the Forest Service. He talks about the four threats, or challenges facing the Forest Service—hazardous fuels, invasive species, loss of open space, and unmanaged outdoor recreation. With respect to fire(per the excerpt provided), Chief Bosworth focuses on the opportunities provided by Healthy Forests Restoration Act to improve forest and rangeland management, healthier landscapes, and reduced risk of catastrophic wildfires. The Flint Foothills Vegetation Management Project is not a HFRA project; the purpose and need does not include reducing the risk of wildfire.*
4	**Bowling, L.C., D. P. Lettenmaier, M. S. Wigmosta and W. A. Perkins "Predicting the Effects of Forest Roads on Streamflow using a Distributed Hydrological Model" from a poster presented at the fall meeting of the American Geophysica Union, San Francisco, CA, December 1996.** "A large scale land use experiment has taken place over the last 40 years in the mountainous areas of the northwestern U.S. through timber harvesting. This land use change effects the hydrology of an area through two mechanisms: Clear-cut logging which causes changes in the dynamics of Rain-On-Snow (ROS) events due to changes in the accumulation and ablation of snow caused by vegetation effects on snow interception and melt; and Construction and maintenance of forest roads which channel intercepted subsurface flow and infiltration excess runoff to the stream network more quickly." http://www.ce.washington.edu/~lxb/poster.html **Review: Relevant to the Project** *This article is from a non-peer-reviewed poster at a conference discussing a field data collection program in support of modeling to predict the*

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	relative effects of road drainage networks on streamflow in the Deschutes River Basin in Pacific Northwest. This poster highlights some of the hydrologic changes that can take place from forest roads. This article also looks at roads that are hydrologically connected to streams, and how this can lead to increases in streamflow, as demonstrated by a hydrologic model. The DEIS addresses potential flow increases as a result of the project. The hydrology of forest roads are discussed in the Hydrology Specialist report. Modeling was completed to address surface water flows and sediment yield on roads and flow connection to streams and potential sedimentation on haul roads. Results are shown in the hydrology specialists report.
4	**Bozeman Chronicle Staff, "Yellowstone fires have potential to grow much larger" *BozemanDailyChronicle*.com, September 24, 2009.** "Yellowstone is a 'fire-adapted ecosystem,' which means wildfire helps maintain the health of the area's wildlife and vegetation. Most park fires are caused by lightning and, whenever possible, monitored and managed, but not necessarily extinguished." http://www.bozemandailychronicle.com/news/article_a4e3e8b5-9304-5b6e-ab70-fa5e8009ff6e.html **Review: Not Relevant to the Project** *This is a press release in a local paper providing information on fires in Yellowstone National Park in 2009, and not a peer reviewed scientific paper. The fire information is not relevant to the Flint Foothills project.*
4	**Brister, Daniel. "A Review and Comment on: Forest Service Roads: A Synthesis of Scientific Information." 2nd Draft. USDA Forest Service. December 1998.** "Many of the conclusions and assumptions contained in the Roads Report are based on analysis of the positive contributions of roads. Negative socio-economic effects of roads have been, in large part, glossed over. The general view expressed in the Roads Report is that overall, roads make a positive socio-economic contribution." "The Socio-Economic Effects section has been constructed to overwhelmingly support the contention that the benefits of roads outweigh the costs. In order to arrive at such a conclusion, however, certain important economic costs and concepts have been omitted." "A serious problem with the Roads Report is its lack of discussion concerning the economic costs arising from the negative ecological effects of roads. Despite overwhelming scientific data linking roads and sedimentation (Bennett 1991; Grayson et al. 1993; Lyon 1984; Megahan 1980; McCashion and Rice 1983; Wade 1998; Williams 1998), the socio-economic costs of mitigating the effects of this sedimentation receive no mention in the Roads Report. Such costs are central to and should be included in any socio-economic assessment of forest roads." "The present road system constitutes a legacy of current and potential sources of damage to aquatic and riparian habitats, mostly through sedimentation, and to terrestrial habitats through fragmentation and increased access" (Amaranthus et all 1985)." "The failure of the Report to properly address mitigation costs associated with the ecological effects is a serious problem that needs to be addressed in future drafts. Similarly, passive-use values need to be taken seriously and considered throughout the Roads Report. In order to rectify these problems, most of the Socio-Economic Effects subsections will have to be reworked. Failing to do so, the Roads Report will paint an incomplete picture of the costs and benefits associated with the Forest Service's road program." http://www.wildlandscpr.org/forest-service-roads-synthesis-scientific-information-socio-economic-impacts

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	Review: Relevant to the Project *This report focuses on roads, highlighting the common economic perspective of roads. For the Flint Foothills Project, road work is limited to routes required to haul cut timber. Proposed road maintenance and reconstruction work would improve the ecological effects of existing roads.*
4	**Brown, Joel. "Power to the People!" *SRM Rangeland News*, November 2007** "On June 29, 2007, Chief of the Forest Service, Gail Kimbell expressed her support of employees participating in professional societies. The following is an excerpt from her support letter. As stewards of forests and rangelands, we must respond to the many challenges of managing a wide variety of resources and values. To meet these various challenges, a diverse and highly qualified cadre of natural resource and other professionals is critical to assure that management approaches are based on the best science. More than ever, it is important for each of us to continue to learn, enhance our resource knowledge, and develop innovative approaches to cooperatively conserve this Nation's natural resources." (pg. 5) http://www.rangelands.org/RN/Nov.RN07.pdf **Review: Not Relevant to the Project** *The Chief's quote, expressing her support of employees participating in professional societies, is included in a Society of Rangeland Management (SRM) newsletter, encouraging Society members to attend the SRM annual meeting. This is not relevant to the Flint Foothills Vegetation Management Project.*
1	**Bull, Evelyn L. 2001. "Effects of Disturbance on Forest Carnivores of Conservation Concern in Eastern Oregon and Washington." Pacific Northwest Research Station. Forestry and Range Sciences Laboratory. La Grande, OR**. "For example: Salvage or thinning operations that remove dead or decayed trees or coarse woody debris on the ground will reduce the availability of forest structures used by fishers and lynx. (Bull et al., 2001.)" http://www.vetmed.wsu.edu/org_NWS/NWSci%20journal%20articles/2001%20files/Special%20issue/v75sp%20p180%20Bull%20et%20al.PDF **Review: Relevant to the Project** *This published, peer-reviewed paper briefly summarizes ecological features associated with forest carnivore habitats and describes potential impacts to species' habitats as a result of management. The summary is derived from existing literature and provides recommended sources for additional information pertaining to forest carnivores. Bull et al. (2001) is referenced in the wildlife (fisher) section of the DEIS.*
4	**Bunnell, Fred L. Ph.D., Kelly A. Squires and Isabelle Houde. 2004. "Evaluating effects of large-scale salvage logging for mountain pine beetle on terrestrial and aquatic vertebrates." Mountain Pine Beetle Initiative Working Paper 1. Canadian Forest Service.** "Sediment input to freshwater is due to either the slower, large-scale process of soil erosion, or to rapid, localized "mass movements," such as landslides. Forest practices can increase the rate at which both processes occur. Most sediment from forestry arises from landslides from roads

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	and clearcuts on steep slopes, stream bank collapse after riparian harvesting, and soil erosion from logging roads and harvested areas. Roads, particularly those that are active for long periods of time, are likely the largest contributor of forestry-induced sediment (Furniss et al. 1991)." "Sediment can increase even when roads comprise just 3% of a basin (Cederholm et al. 1981)." "More than half the species present in the study area will likely be negatively impacted by sedimentation from logging roads." "In areas made highly turbid (cloudy) from sedimentation, the foraging ability of adults and juveniles may be inhibited through decreased algal production and subsequent declines in insect abundance, or, for visual-feeding taxa dependent on good light, through their inability to find and capture food. Highly silted water may damage gill tissue and cause mortality or physiological stress of adults and juveniles." http://warehouse.pfc.forestry.ca/pfc/25154.pdf **Review: Relevant to the Project** This article is from a Canadian Government publication. The article is about the effects of salvage logging on multiple species in Canada. Sediment generated from roads and landslides is identified as a possible impact to fish and water quality. In the article, it was thought that large-scale salvage operations are unlikely to result in positive impacts on freshwater fish. One of the main recommendations for mitigating effects for fish was to retain unharvested riparian buffers around wetlands and lakes. Riparian Conservation areas will be established for this project consistent with this recommendation. Further, effects of sedimentation are expected to be reduced in this project because BMPs that have been demonstrated to be effective will be used to control sedimentation that might occur as a result of this project. The Flint Foothills project includes design features and mitigations that minimize and reduce impacts of roads. Analysis of impacts to aquatic habitats and species are discussed in the EIS.
4	**Burns, James W., "Some Effects of Logging and Associated Road Construction on Northern California Streams." Transactions of the American Fisheries Society, Volume 1, Number 1, January 1972.** "The road construction and right-of-way logging were immediately detrimental to most aquatic invertebrates in South Fork Caspar Creek" "Salmonid populations decreased immediately after the road construction." "Sustained logging and associated road construction over a period of many years do not afford either the stream or the 'fish population a chance to recover." http://www.fs.fed.us/psw/publications/4351/Burns72.pdf **Review: Relevant to the Project** *This article is from a peer-reviewed publication. It looks at the effect of forest road construction on stream sedimentation. Sediment generated from roads is identified as a possible impact to fish and water quality in Northern California. Effects of sedimentation are expected to be reduced in this project because BMPs will be used to control sedimentation that might occur as a result of this project.*
4	**Buttenfield, Barbara P. Ph.D. and David R. Cameron. "Scale Effects and Attribute Resolution in Ecological Modeling." A paper presented at 4th International Conference on Integrating GIS and Environmental Modeling. Banff, Alberta, Canada, September 2 – 8, 2000.** "In the temporal analysis, from 1950 to 1993, logging and road building in the study area clearly modified landscape patterns. Increased landscape fragmentation is evident in measures of smaller mean patch and core areas, reduced patch size variability, increased patch and edge density, and

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	higher edge contrast." http://www.colorado.edu/research/cires/banff/pubpapers/158/ **Review: Relevant to the Project** *This paper reports a multi-scale landscape study of data collected in the Colorado San Juan Mountains. Results show that patterns of landscape structure differ with and without the imposition of roads as patch boundaries, and that these differences vary with species composition. The paper is an argument for 'a reconsideration of functional scale that is based on attributes and process resolution' or the computational mechanics of a GIS modeling exercise. The excerpt has relevance to the project and is discussed in the DEIS pertaining to large openings and road effects.*
4	**Byrd, Caroline and Nancy Debevoise. "Court Upholds Road-Building Moratorium." Wyoming Outdoor Council. Frontline Newsletter, Winter 2000.** "Few human activities pose more of a threat to the well-being of wildlife and the integrity of forested watersheds than road building. Roads create human corridors that increase hunting pressure, particularly poaching, and fragment wildlife habitat into isolated islands, cutting animals off from their own species, food, water and cover, decreasing their chances of survival and making them more vulnerable to extinction." "Forest roads also have overwhelmingly negative effects on fish habitat. Road cuts, ditches and shoulders generate stream sediment, which fills in pools and smothers streambed cobbles vital for spawning. Stream crossings and culverts can block fish from moving up and down stream. Roads introduce fuel, pesticides, toxins from oil and gas development and mining wastes into streams and increase the likelihood of toxic spills. In addition, roads accelerate soil erosion rates from 30 to 300 times, inviting catastrophic landslides that threaten the environment, human life and property." http://www.wyomingoutdoorcouncil.org **Review: Not Relevant to the Project** *The referenced article was not available on the Council's website. Per the citations provided, this is an opinion piece and not peer-reviewed literature. The Flint Foothills analysis addresses the effects of road construction on various wildlife species. The wildlife analysis contains references to peer-reviewed literature related to road impacts on wildlife and habitats.*
4	**Calvert, Jeffrey Ph.D. "A healthy forest needs bugs." California Forest Stewardship Program, 2002.** "Television commercials tell us that the only good bug is a dead bug. But stop a moment and think about all the important jobs insects do: they pollinate plants including trees, provide food for fish, birds, and other creatures, help decompose dead material, and make nutrients available to the forest. Insects keep our forests healthy." http://ceres.ca.gov/foresteward/html/bugs.html **Review: Not Relevant to the Project**

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	This reference is an information bulletin from California Forest Stewardship Program on insect outbreaks. It is written for public land owners and explains in very simple terms, the vast role of insects in our forests. It explains some of the reasons for insect outbreaks, and provides recommendations on what the public/land owners should do when "pests" are abundant. The information on insects is relevant in a very general way; the recommendations are not relevant to the Flint Foothills Project.
4	**Campbell, John L. Ph.D, Dan C. Donato, Joe B. Fontaine., J. Boone Kauffman Ph.D., Beverly E. Law Ph.D., and Doug Robinson. "Biscuit Fire Study." Oregon State University Department of Forest Science Terrestrial Ecosystem Research and Regional Analysis. 2003.** "Recently burned areas represent an important type of habitat that many species of animals have evolved to utilize. Snags (standing dead trees) provide critical nesting and foraging habitat for birds and small mammals, and as they decay and fall, create additional habitat for small mammals and terrestrial amphibians as coarse woody debris." http://zircote.forestry.oregonstate.edu/terra/biscuit.htm **Review: Relevant to the Project** *The above quote is part of a summary statement supporting the relevance of a proposed scientific study concerning post-fire logging on the Biscuit Fire in southern Oregon. In the summary statement, only objectives are identified. No report containing study design, results, and conclusions was found. The wildlife analysis addresses snags as a source of wildlife habitat as well as the potential impacts to snag resources as a result of proposed activities.*
4	**Canadian Broadcasting Company News. June 17, 2009. "Fighting fire in the forest"** "Since those early days, millions of dollars have been spent on campaigns to prevent forest fires. But researchers now know that fire is not necessarily bad. It can be a natural part of a healthy grassland or forest ecosystem. Fire reduces the buildup of dead and decaying leaves, logs and needles that accumulate on the forest floor. It reduces or eliminates the overhead forest canopy, increasing the sunlight that stimulates new growth from seeds and roots. Many plants and animals have adapted to fire. Both lodgepole pine and jack pine have resin-sealed cones that stay on trees for many years. The heat of fire melts the resin and the cones pop open. Thousands of seeds then scatter to the ground and grow into new stands of pine. Woodpeckers feast on bark beetles and other insects that colonize in newly burned trees. And so, 20 years ago, Parks Canada decided that it wouldn't interfere in natural processes such as fire, insects and disease unless it had to — that is, unless people or neighbouring lands were threatened." http://www.cbc.ca/canada/story/2009/06/17/f-forest-fires.html **Review: Not Relevant to the Project** *This is a general news article about fighting forest fires in Canada, the ecological benefits of fire, and the effects fire has on weather, including the release of high volumes of greenhouse gas from wildfire. While the focus of the article is on wildfire, the prescribed burning proposed in the Flint*

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	Foothills project would realize some of the benefits provided in the excerpt in the context of the purpose and need for the proposal.
4	**Canadian Forest Service. 2003. "Native Forest Insects and Diseases"** "Native insects and diseases are intrinsic and necessary components of most terrestrial ecosystems. These and other natural disturbances, such as fire, are the drivers of forest diversity, structure, and function. Although at times devastating to the forest, they are necessary for the sustainability of forests (Aber and Melillo 1991, Attiwill 1994). Insects and diseases do cause economic harm. For the period 1982-1987, losses due to insects and diseases in Canada were estimated at over 100 million m3 annually or one third of the annual harvest (Hall and Moody 1994). Forest managers must balance volume loss without interfering with the necessary ecological functions that these agents provide to sustain a healthy forest." http://www.health.cfs.nrcan.gc.ca/BorealShield/nativeInsectsAndDiseases/ **Review: Not Relevant to the Project** *The link provided did not access the referenced paper. However, reading the excerpts provided, the analysis for the project recognizes the function of natural disturbances of insects and fire on forest diversity, structure and function, and with the scale of the project as compared to the untreated portions of the project area, does a reasonable job of balancing volume loss and economic recovery with allowing ecological functions to occur without management. (Vegetation section.)*
4	**Canadian Wildlife Service. 2005. Review notes sent to Robin Sharples, Environmental Assessment Coordinator, Government of the Yukon, Forest Management Branch. June 13, 2005 regarding the post-fire plans for the Barney Lake and False Canyon Creek fires.** "Lindenmayer et al. (2004), note that "To many ecologists, natural disturbances are key ecosystem processes rather than ecological disasters that require human repair"." http://www.emr.gov.yk.ca/pdf/barney_and_false_environment_canada.pdf **Review: Not Relevant to the Project** *The link provided did not access the referenced paper. However, based on the excerpts provided, the analysis for the Flint Foothills project recognizes the function of natural disturbances of insects and fire on forest diversity, structure and function, rather than an ecological disaster that requires human repair. (Vegetation section.)*
4	**Canfor Corporation, 2007. "Forest Protection – Insects"** "Insects are a part of the complex forest ecosystem. Like all parts of the ecosystem they have a role to play and they interact with many other components. This group of organisms is incredibly diverse and their ecosystem functions are equally diverse. The ecological role of insects ranges from benefactor to killer, with the beneficial insects being the most abundant. Pollination is an important role played by some insects. Wasps and bees pollinate flowering trees and shrubs. Speeding up decay is another insect function. Insects such as ants, termites and wood boring beetles bore into the wood of dead trees, speeding up the invasion of wood decaying microbes. Insects speed up nutrient cycling within the soil. Insects

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	such as collembolans, thysanurans, beetles, and flies feed on organic matter and fungi, speeding the flow of nutrients to the soil. Other insects can act as predators and parasites of herbivorous insect pests. Under normal conditions these natural enemies control these pest populations. Insects also act as food sources for many insectivorous birds, amphibians and mammals. These multiple roles indicate the complexity of insect functions in the forest ecosystem. Insects are involved in the ecological processes of the forest, including in forest stability, succession and productivity. Over time, the insect populations of the host tree, attacking insects and insect enemies fluctuate and end up regulating the composition and abundance of each. This impacts ecosystem stability. By feeding on unhealthy trees, insects help to re-cycle the nutrients from the dying trees to the healthy survivors. This maximizes the productivity of the average tree. The number of beneficial or non-harmful insect species in a forest is large. They play many essential roles within the forest ecosystem." http://www.canfor.com/treeschool/library/files/insects.asp **Review: Not Relevant to the Project** *The Canfor Corporation is a forest products company in Vancouver, British Columbia. This paper is a general discussion on insects and their ecological role; the "damage" they do to the forests; and the role of pest management practices. It concludes that applied ecology is critical with its emphasis on natural enemies and environmental conditions to help keep insect populations under control. The Flint Foothills project is not attempting to control insect populations; rather it is addressing conditions created by the current mountain pine beetle epidemic to meet Forest Plan objectives.*
4	**Christensen, Norman L. Jr., Ph.D., Testimony before the Senate Committee on Agriculture, Nutrition and Forestry regarding H.R. 1904—the Healthy Forests Restoration Act of 2003 June 26, 2003** "Why isn't it true that 'the more wood removed the better'? Why should 'big, old' trees be retained? First, larger-diameter woody materials do not pose a significant threat for wildfire ignition or spread. It is largely the finer fuels (a few inches and less in diameter) that carry fire. More important, large, old trees actually provide protection from fire spread because they are resistant to fire and their shade maintains favorable moisture conditions in the understory fuels. Too much thinning of the forest canopy can produce more rapid drying of such fuels and, thereby, more frequent and severe wildfire risk. Furthermore, big, old trees provide critical habitat and maintain key ecosystem functions." http://wwwpaztcn.wr.usgs.gov/fire/hr_1904_testimony_christensen.pdf **Review: Not Relevant to the Project** *This is a statement before the U.S Senate on the Healthy Forests Restoration Act of 2003. Mr. Christensen states his support of the intent of the legislation and provides five specific ways it should be improved. It contains no sources, references, or literature cited. Commercial thin treatments in the Flint Foothills project are designed to promote large tree characteristics in stands The comment that the more drying would lead to "more frequent and severe wildfire risk" is contradictory. The more frequently fires burn in a forested environment, the less intense and severe they will be. Hazardous fuels reduction is not part of the purpose and need of this project,*
4	**Christensen, Norman L. Jr. et al. excerpt from a September 9, 2002 letter to President Bush**

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	"In some areas the use of prescribed fire without any "thinning" would be the best restoration method. Indeed, many forests in the West do not require any treatment. These are forests that for thousands of years have burned at long intervals and only under drought conditions, and have been altered only minimally by 20th century fire suppression. These forests are still "healthy" and thinning would only disturb them, not "restore" them. In short, the variation among our forested landscapes is much too great for one treatment to be appropriate everywhere. Where thinning is used for restoration purposes in dry forest types, removal of small diameter material is most likely to have a net remedial effect. Brush and small trees, along with fine dead fuels lying atop the forest floor, constitute the most rapidly ignited component of dry forests (young forest stands regenerating after timber harvest often burn with the greatest intensity in western wildfires). They most surely post-date management-induced alteration of dry forest fire regimes. And their removal is not so likely to increase future fire intensity, for example from increased insulation and/or the drying effects of wind." http://docs.nrdc.org/land/files/lan_07062801g.pdf **Review: Not Relevant to the Project** *This is an opinion letter sent from a cadre of University leaders. Much of the caution suggested in the letter is actually incorporated in this project, wherein there is not a one sized action being prescribed, but a multitude of specific actions that vary depending on the vegetation type.*
4	**Cohen, Jack D. Ph.D. 1999. "Reducing the Wildland Fire Threat to Homes: Where and How Much?" Fire Sciences Laboratory, Rocky Mountain Research Station, Missoula, MT. USDA Forest Service Gen. Tech. Rep. PSW-GTR-173.** "These research conclusions redefine the WUI fire problem as a home ignitability issue largely independent of wildland fuel management issues. Consequently, this description has significant implications for the necessary actions and accompanying economic considerations for fire agencies. "The congruence of research findings from different analytical methods suggests that home ignitability is the principal cause of home losses during wildland fires. Any WUI home fire loss assessment method that does not account for home ignitability will be critically under specified and likely unreliable. Thus, land classification and mapping related to potential home loss must assess home ignitability." "As stated, the evidence indicates that home ignitions depend on the home materials and design and only those flammables within a few tens of meters of the home (home ignitability). The wildland fuel characteristics beyond the home site have little if any significance to WUI home fire losses." "Because homeowners typically assert their authority for the home and its immediate surroundings, the responsibility for effectively reducing home ignitability can only reside with the property owner rather than wildland agencies." http://www.fs.fed.us/rm/pubs_other/rmrs_1999_cohen_j001.pdf **Review: Not Relevant to the Project** *The citation references the flammability of structures within a defined urban interface, and defines who should be responsible for fuels treatments within wildland-urban interface (WUI) and the effectiveness of said treatments in reducing wildfire risk and spread. The Flint Foothills Project purpose and need does not include a reduction in the risk of wildfire and/or how it relates to ignition probability of structures within a defined*

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	wildland-urban interface. This paper discusses how wildland vegetation management could not necessarily protect a home from fire, and homeowners are ultimately responsible for protecting their homes from fire. Cohen states, "home ignitability, i.e., the potential for a home fire loss, is the homeowner's choice and responsibility." This paper does not state that vegetation management is not needed; in fact it discusses the need for management to enhance the ability to control fires in WUIs. This quotation has been taken out of context.
4	**Cohen, Jack D. Ph.D. 2003. "Structure Ignition Assessment Model (SIAM)" USDA Forest Service Gen. Tech. Rep. PSW-GTR-158. 1995.** "These results suggest that to reduce ignitions, the distances from a structure for managing vegetation are much smaller than the lofting distances for firebrands. Thus, beyond some relatively short distance from the structure (depending on the vegetation and topography), vegetation management has no significant benefit for reducing flame generated ignitions. Vegetation management, on the other hand, cannot be extensive enough, in a practical sense, to significantly reduce firebrand ignitions. Therefore, the structure and its immediate surroundings should be the focus for activities intended for improving ignition risk." "In high-density residential areas containing highly flammable structures (e.g., residences with flammable roofs), vegetation management may not be sufficient to prevent widespread fire destruction." (pg. 92) http://www.fs.fed.us/psw/publications/documents/psw_gtr158/psw_gtr158_05_cohen.pdf **Review: Not Relevant to the Project** *The citation references the effectiveness of thinning treatments, within a defined urban interface, on reducing wildfire risk. The Flint Foothills Project purpose and need does not include a reduction in the risk of wildfire and/or how it relates to ignition probability of structures within a defined wildland-urban interface.*
4	**Collins, Sally. Associate Chief USDA Forest Service. From a speech "Changing Public Land Uses: A Tale of Two Debates." Outdoor Writers Association of America, 76th Annual Conference, Columbia, MO-June 17, 2003.** "Where we do cut timber, it is usually a byproduct of forest health projects." "Our focus today in the Forest Service is no longer on logging and road-building. In the last 5 years, for example, we decommissioned 14 miles of road for every mile of road added to our forest road system. And where we do cut timber, it is usually a byproduct of forest health projects-like cutting 14-inch white fir to protect giant sequoia groves." http://www.fs.fed.us/news/2003/speeches/06/collins.shtml **Review: Not Relevant to the Project** *The speech by Forest Service Associate Chief Sally Collins addresses the changes in use of public land over time (reflected in the excerpt provided) and how Americans get their information on environmental issues from the media. She asks the audience of outdoor writers to do a better job of telling the story of the threats to long-term ecosystem health. While the Flint Foothills Vegetation Project reflects the changes in use of public lands, the speech is not directly relevant to the project.*

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4	**Collins, Sally. Associate Chief USDA Forest Service. From a speech "Protecting Open Spaces: Partners in a Common Cause." Land Trust Alliance Rally. October 31, 2004.** "Always use the best science. Science can't decide for us, but it can help us understand the consequences of our decisions. Forest Service Research and others in academia can deliver some of the best science and technical resources to help inform how these special areas should be managed for the long term." http://www.fs.fed.us/news/2004/speeches/10/open-spaces.shtml **Review: Not Relevant to the Project** *The speech by Forest Service Associate Chief Sally Collins addresses the changes in use of public land over time and how Americans get their information on environmental issues from the media. She asks the audience of outdoor writers to do a better job of telling the story of the threats to long-term ecosystem health. The excerpt provided is an example Associate Chief Collins used to illustrate how public land use has changed. This speech is not specific to the Flint Foothills Vegetation Project. The project analysis considers the latest and best science available—over 100 references are cited in the analyses.*
4	**Collins, Sally. Associate Chief USDA Forest Service. From a speech "The Future of Partnering with the Forest Service." Annual Meeting of the National Association of Conservation Districts. Atlanta, GA—February 8, 2005.** "Post-World War II, we entered a new period characterized by timber production. From the 1960s to the 1980s, every administration, with strong congressional support, called for more timber harvest from the national forests, with the goal of replacing the depleted stocks of private and state timber as a result of the war effort. We measured success largely in terms of producing timber and providing multiple uses, including outdoor recreation and fish and wildlife.In the early 1990s, that changed again. Today, we're in a new period focused primarily on ecological restoration and recreation. Maybe more than ever before, we are focusing on delivering values and services like clean air and water, scenic beauty, habitat for wildlife, and opportunities for outdoor recreation. Not only do Americans want these things from their national forests, but this shift is also essential to cope with some huge threats to the sustainability of these forests." (pp 8-9) http://www.fs.fed.us/spf/coop/library/NACDspeech.pdf **Review: Relevant to the Project** *This speech by Associate Chief Collins, shares perspectives on the history of the Forest Service and emphasizes the recent period focus on ecological restoration and recreation. Collins stresses the need to work through collaborative partnerships for long-term ecosystem health .The Flint Foothills project is not addressing forest health per se, rather, it is addressing conditions created by the current mountain pine beetle epidemic to meet Forest Plan objectives, including resiliency. Any Forest Service project benefits from collaborative partnerships.*
4	**Collins, Sally. Associate Chief USDA Forest Service. From testimony before the Committee on Energy and Natural Resources, United States Senate. July 11, 2006.**

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	"Our direction will address these emerging issues to ensure it is based on the available best science." http://www.fs.fed.us/congress/109/senate/oversight/collins/071106.html **Review: Not Relevant to the Project** *The testimony focuses on renewable energy on federal lands, with respect to the Energy Policy Act of 2005, involving energy-related leases and permits on Federal lands. .This testimony is not relevant to the Flint Foothills Vegetation Management Project. With respect to "the available best science," the Flint Foothills project considers the latest and best science available, with over 100 references cited in the analyses*
4	**Congressional Research Service. Report for Congress. "Forest Fire/Wildfire Protection." February 14, 2005.** "Finally, as mentioned above, wildfires can also generate benefits. Many plants regrow quickly following wildfires, because fire converts organic matter to available mineral nutrients. Some plant species, such as aspen and especially many native perennial grasses, also regrow from root systems that are rarely damaged by wildfire. Other plant species, such as lodgepole pine and jack pine, have evolved to depend on stand replacement fires for their regeneration; fire is required to open their cones and spread their seeds. One author identified research reporting various significant ecosystems threatened by fire exclusion — including aspen, whitebark pine, and Ponderosa pine (western montane ecosystems), longleaf pine, pitch pine, and oak savannah (southern and eastern ecosystems), and the tallgrass prairie. [57] Other researchers found that, of the 146 rare, threatened, or endangered plants in the coterminous 48 states for which there is conclusive information on fire effects, 135 species (92%) benefit from fire or are found in fire-adapted ecosystems." [58] "Animals, as well as plants, can benefit from fire. Some individual animals may be killed, especially by catastrophic fires, but populations and communities are rarely threatened. Many species are attracted to burned areas following fires — some even during or immediately after the fire. Species can be attracted by the newly available minerals or the reduced vegetation allowing them to see and catch prey. Others are attracted in the weeks to months (even a few years) following, to the new plant growth (including fresh and available seeds and berries), for insects and other prey, or for habitat (e.g., snags for woodpeckers and other cavity nesters). A few may be highly dependent on fire; the endangered Kirtland's warbler, for example, only nests under young jack pine that was regenerated by fire, because only fire-regenerated jack pine stands are dense enough to protect the nestlings from predators." In summary, many of the ecological benefits of wildfire that have become more widely recognized over the past 30 years are generally associated with light surface fires in frequent-fire ecosystems. This is clearly one of the justifications given for fuel treatments. Damage is likely to be greater from stand replacement fires, especially in frequent-fire ecosystems, but even crown fires produce benefits in some situations (e.g., for the jack pine regeneration needed for successful Kirtland's warbler nesting)." http://www.coloradofirecamp.com/congressional_research/forest-fire-wildfire-effects.htm **Review: Not Relevant to the Project** *The excerpt provided here is not included in the CRS report for Congress. The actual report addresses concerns over wildfires, the effects on the wildland urban interface, and forest and rangeland health. It discusses the deleterious effects that fire suppression has had with respect to creating*

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	unnatural fuel loading. The report concludes with an estimate of the acres at risk of ecological change, by historic fire regime. The purpose and need for the Flint Foothills Project does not include the reduction of fuels.With respect to the excerpt, we agree there are many benefits of wildfire, the Flint Foothills Project is not a fuels project and there is nothing in the purpose and need that addresses fuels.
4	**Crist, Michele Ph.D.and Ed Roworth Ph.D. "Cumulative effects of roads and logging on landscape structure in the San Juan Mountains, Colorado (USA)" *Landscape Ecology*, Volume 16, Number 4 / May, 2001.** "Overall, roads had a greater impact on landscape structure than logging in our study area. Indeed, the 3-fold increase in road density between 1950–1993 accounted for most of the changes in landscape configuration associated with mean patch size, edge density, and core area." McGarigal, Kevin Ph.D., William H. Romme Ph.D. http://www.springerlink.com/content/w12557624742tv77/ **Review: Relevant to the Project** *The study referenced Forest Service lands all above 7,872 feet in elevation in mixed conifer and subalpine spruce stands, which ecologically are different and at higher elevations than the dry lodgepole and Douglas-fir stands of the project are. While the geographic and biologic conditions differ, there are effects associated with past harvest and road construction to consider in in the Flint Foothills Project in combination with the proposed actions. These effects are discussed in the wildlife section of the DEIS.*
4	**Cushman, John H. Jr. "Audit Faults Forest Service on Logging Damage in U.S. Forests" *New York Times,* February 5, 1999** "Federal auditors have found that the Forest Service frequently fails to assess, prevent or correct environmental damage from logging on the national forests. After inspecting 12 timber projects in the field from 1995 to 1998, the Agriculture Department's inspector general found that all were deficient and that 'immediate corrective action is needed.' A new report on the audits found that the environmental studies required before logging was approved were poorly done, the rules to protect streams and wildlife habitat from undue damage during logging were not followed, and the steps planned to repair some of the harm after logging were not carried out. The inspector general, Roger C. Viadero, reported on Jan. 15 to Mike Dombeck, chief of the Forest Service, that the review had found ''numerous serious deficiencies.'' Agency officials generally agreed with the report's conclusions and recommendations." http://query.nytimes.com/gst/fullpage.html?res=9B00E2DF163BF936A35751C0A96F958260&sec=&spon=&pagewanted=print **Review: Relevant or Not Relevant to the Project** *The article cites an Agriculture Department inspector general's report, summarizing review of 12 timber sales from 1995-1998. The article states the report finds fault with both the environmental assessments for the projects and that "rules" were not followed when the sales were implemented on the ground. The report looked at a number of timber sale contracts and NEPA project-level analyses to determine compliance with mitigations and*

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	terms of the decisions and contracts. The article was not applied by the commenter to the site-specific aspect of this NEPA analysis. Programmatic reviews such as the one discussed in the article are not specific to the Flint Foothills Vegetation Management Project's site-specific environmental analysis.
4	**DellaSala, Dominick A. Ph.D. and Evan Frost. 2001. "A Comprehensive Strategy for Roadless Area Conservation and Fuels Reduction in Priority Areas"** "Some land managers and forest scientists advocate the widespread use of silvicultural treatments (of which thinning is the most widely proposed harvest-based fuels reduction method) in western roadless areas to reduce fuel loads and tree stocking levels, and thereby decrease the probability of large, intense fires. Although thinning within the context of intensive forestry is not new, its efficacy as a tool for fire hazard reduction at the landscape scale is controversial, largely unsubstantiated, and fundamentally experimental in nature thereby requiring caution particularly when applied across large landscapes." (FEMAT 1993, Henjum et al. 1994, DellaSala et al. 1995, SNEP 1996, USDA Forest Service 2000) "There have been only a few empirical studies that have tested the relationship between thinning or fuels treatment and fire behavior on even a limited basis. In spite of hypothesized benefits, these studies, as well as anecdotal information and analysis of recent fires, suggest that thinning treatments have highly variable results. In some instances, thinning treatments intended to reduce fire hazard appear to have the opposite effect (Huff et al. 1995, van Wagtendonk 1996, Weatherspoon 1996). Such treatments may reduce fuel loads, but they also allow more solar radiation and wind to reach the forest floor. The net effect is usually reduced fuel moisture and increased flammability." (Countryman 1955, Agee 1997) http://www.kettlerange.org/salvagelogging/DellaSala&Frost_Comprehensive_Strategy.html **Review: Not Relevant to the Project** *The paper summarizes available evidence on the relationship between fire and timber management in roaded vs. roadless areas, and evaluates the ecological impacts of silvicultural treatments and prescribed fire for fire hazard reduction in roadless areas. The quotation is from outdated sources and incorrect. The second portion of the quotation incorrectly cites Huff et al. (1995) because the Huff et al. (1995) paper does not mention thinning treatments that are "intended to reduce fire hazard" as "appearing to have the opposite effect." The Huff et al. (1995) paper doesn't mention the "intentions" of any treatments at all. Their analysis was based upon aerial photo interpretation without site- and treatment-specific data. Weatherspoon (1996, Fire-silviculture relationships in Sierra forests) discusses differences in tree damage due to 1987 wildfires in California in uncut areas and partially cut with fuel treatment areas. In the study the partially cut areas had, on the average, a higher degree of damage than the uncut areas even though fuels treatments had taken place. He offers several reasons for the results one of which is: "When only the management compartments containing fuel-treated stands (a small subset of the total number of compartments in the study) were analyzed separately, differences in fire damage between uncut and partial-cut and treated stands virtually disappeared. Evidently, lower average levels of damage in uncut stands in the remaining compartments changed the relationship in the overall analysis." In other words, he is saying that one reason for the treated stands appearing to have greater damage than the uncut stands was due to the way they combined and analyzed the data. The citation references the effectiveness of thinning projects and fuels treatments in reducing the risk of wildfire occurrence. The Flint Foothills Project purpose and need does not include a reduction in risk of wildfire, and the action alternatives do not propose harvesting in roadless areas.*
1	**DellaSala, Dominick A., Anne Martin, Randi Spivak, Todd Schulke, Bryan Bird, Marnie Criley, Chris van Daalen, Jake Kreilick, Rick Brown,**

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	and Greg Aplet, 2003. A Citizen's Call for Ecological Forest Restoration: Forest Restoration Principles and Criteria. Ecological Restoration, Vol. 21, No. 1, 2003 ISSN 1522-4740 **http://er.uwpress.org/cgi/reprint/21/1/14?maxtoshow=&hits=10&RESULTFORMAT=&author1=dellasala&andorexactfulltext=and&searchid=1&FIRSTINDEX=0&sortspec=relevance&volume=21&resourcetype=HWCIT** As related to letter 1, comment 35, additional literature to address **Review: Relevant to the Project** *The principles presented in this paper support this project's purpose and need, and therefore this paper is relevant to the project.*
4	**deMaynadier, Phillip G. and Malcolm L. Hunter, Jr. "Road Effects on Amphibian Movements in a Forested Landscape."** "The total area of land converted to road surface and shoulder clearance for permanent logging roads can represent a significant loss of former habitat in densely roaded regions. In this study, six acres of forest habitat were lost for every linear mile of road. Stewards of natural areas and managed forests who are concerned about the potential impacts of secondary roads on sensitive species should construct fewer and narrower roads with little or no edge clearance." http://www.magicalliance.org/Fragmentation/road_effects_on_amphibian_moveme.htm **Review: Relevant to the Project** *The effects of constructing 1.26 miles of new NFS road are addressed in the DEIS wildlife section. Temporary roads would be cleared to minimum widths needed and decommissioned upon completion of project activities.*
1	**Depro, Brooks M., Brian C. Murray, Ralph J. Alig, and Alyssa Shanks. 2008. "Public land, timber harvests, and climate mitigation: quantifying carbon sequestration potential on U.S. public timberlands." *Forest Ecology and Management* 255: 1122-1134.** "Published scientific reports indicate that climate change will be exacerbated by logging due to the loss of carbon storage. Additionally, published scientific reports indicate that climate change will lead to increased wildfire severity (including drier and warmer conditions that may render obsolete the proposed effects of the Project). The former indicates that the Stonewall Vegetation Project may have a significant adverse effect on the environment, and the latter undermines the central underlying purpose of the Project. Therefore, the Forest Service must candidly disclose, consider, and fully discuss the published scientific papers discussing climate change in these two contexts. At least the Forest Service should discuss the attached following studies: http://www.fs.fed.us/pnw/pubs/journals/pnw_2008_depro001.pdf **Review: Not Relevant to the Project** *The Depro paper is an assessment of carbon sequestration for all public lands managed under two scenarios; a no action – no more harvest – scenario of all public lands, and a harvest-level-done-in-the-1980s scenario. The Flint Foothills Project does not propose to harvest at levels*

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	conducted in the 1980s, and is the scope of the project is not national in size. The scale of the analysis in Depro et. Al. paper is focused at the policy-level and its findings are not relevant at the project scale.
	Harmon, Mark E. et al. 2001. "Carbon sequestration in forests: addressing the scale question." *Journal of Forestry* 99:4: 24-29. http://docserver.ingentaconnect.com/deliver/connect/saf/00221201/v99n4/s5.pdf?expires=1288497231&id=59423682&titleid=3830&accname=National+Forest+Service+Library&checksum=E9C2B074CC129818DE1E86EC1EE5D415 **Review: Not Relevant to the Project** *This article could not be reviewed; the link does not work.*
	Harmon, Mark E, William K. Ferrell, and Jerry F. Franklin. 1990. "Effects of carbon storage of conversion of old-growth forest to young forests." *Science 247*: 4943: 699-702 http://www.sciencemag.org/cgi/reprint/247/4943/699.pdf **Review: Not Relevant to the Project** *This article is about the conversion (harvest) of old growth forests to young forest plantations in western Oregon and Washington. The Flint Foothills Project does not alter the status of old growth stands, and takes place in southwestern Montana.*
	Harmon, Mark E, and Barbara Marks. 2002. "Effects of silvicultural practices on carbon stores in Douglas-fir – western hemlock forests in the Pacific Northwest, USA: results from a simulation model". *Canadian Journal of Forest Research* 32: 863-877. http://article.pubs.nrc-cnrc.gc.ca/RPAS/rpv?hm=HInit&journal=cjfr&volume=32&calyLang=eng&afpf=x01-216.pdf **Review: Not Relevant to the Project** *This study occurs in the forest types of Oregon and Washington Cascade mountains. The conclusion of the modeling exercise is that an adequate supply of wood products may not be incompatible with a system that increases carbon stores. The forest types in the project area are not as productive and store less carbon than the Cascade forests.*
	Homann, Peter S., Mark Harmon, Suzanne Remillard, and Erica A.H. Smithwick. 2005. "What the soil reveals: potential total ecosystem C stores of the Pacific Northwest region, USA." *Forest Ecology and Management* 220: 270-283. http://www.fs.fed.us/pnw/pubs/journals/pnw_2005_homann001.pdf **Review: Relevant or Not Relevant to the Project** *This study occurs in the forest types of Oregon and Washington coast range to Cascade mountains. The forest types in the project area are not as productive with substantially less organic matter in soils with the dry, Continental forest types, and store less carbon than the western Oregon and Washington forests.*
	McKenzie, Donald, Ze'ev Gedalof, David L. Peterson, and Philip Mote. 2004. "Climatic change, wildfire, and conservation." *Conservation Biology* 18:4: 890 -902.

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	http://onlinelibrary.wiley.com/doi/10.1111/j.1523-1739.2004.00492.x/pdf **Review: Relevant to the Project** *This paper assesses the increases in amplitude and duration of extreme fire weather due to climate change, and that a resultant change in distribution and abundance of habitat to some sensitive plant and animal species may be affected. Although the paper is a general overview of potential change, the conclusion provided is that climatic change, fire policy, and fuel-treatment strategies are complex biosocial issues, and integrating them with wildlife conservation objectives is challenging. Though public distrust of motivations for conducting fuel treatments and agency frustration with appeals and litigation create a challenging ecological and social context for decision making, reasoned discussions among decision makers, public-land managers and stakeholders at local and regional scales can help to mitigate risk to ecosystems and sensitive species.*
4	**Diaz-Soltero, Hilda. Associate Chief for Natural Resources, USDA Forest Service. From an interview "Women in Natural Resources." Vol. 21, No. 3 August 2000.** "The agency has been able to face changing and challenging times and incorporate new information based on science." "I am very much involved in trying to integrate the science and the management sides of the Forest Service. It's very, very important that we conduct that integration, because our management decisions are scientifically based, and there is an ever increasing need for more scientific information." http://www.fs.fed.us/publications/2000/00nov02-Hilda-Diaz-Soltero-Interview.pdf **Review: Relevant to the Project** *The article documents an interview with then Associate Chief for Natural Resources. The excerpt is in the context of integrating forest inventories (i.e. FIA, NRIS) into the management side for decision making. The Flint Foothills Vegetation Management Project utilizes FIA data for its vegetation and wildlife analysis*
4	**Dombeck, Mike, Ph.D. USDA Forest Service Chief. Remarks made to Forest Service employees and retirees at the University of Montana. February 1998.** "Roads often cause serious ecological impacts. There are few more irreparable marks we can leave on the land than to build a road." **Review: Relevant to the Project** *In his speech, Chief Dombeck shares the core principles of his forthcoming natural resource agenda, which addresses watershed health and restoration, sustainable forest ecosystem management, forest roads and recreation; and shares highlights of the President's proposed FY99 budget. With respect to roads, Chief Dombeck states that forest roads are an essential part of the transportation system, providing benefits as well as causing serious ecological impacts. Thus, he proposed a new long-term forest road policy with four primary objectives: 1) More carefully consider decisions to build new roads. 2) Eliminate old unneeded roads. 3) Upgrade and maintain the roads important to public access. 4) Develop*

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	new and dependable funding for forest road management. The existing haul routes that would be used to haul timber from the Flint Foothills project area would receive needed maintenance work prior to any log hauling to reduce sediment delivery to adjacent streams. All temporary roads would be obliterated following harvest activities.
4	**Dombeck, Mike, Ph.D. USDA Forest Service Chief. "Forest Chief Shifts focus to clean water" April 1998 *Transitions* page 30. (Statement)** "The Forest Service must be a leader in using the best science and the best managers to accomplish what I think is one of the noblest, most important callings of our generation bringing people together and helping them find ways to live within the limits of the land." http://www.waterplanet.ws/transitions/tr9804/ **Review: Relevant or Not Relevant to the Project** *The speech, not directly referencing the Flint Foothills Project, focused on Chief Dombeck's vision for the agency, to leave the watersheds "healthier, more diverse and more productive." The use of the best available science will help accomplish the vision. The Flint Foothills project considers the latest and best science available—over 100 references are cited in the analyses*
4	**Dombeck, Mike, Ph.D. USDA Forest Service Chief. "Through the Woods" The News Hour with Jim Lehrer. 19 June 1998.** "The timber harvest shouldn't be dominant. It should be on an equal plane with recreation concerns, with wildlife concerns, hunting, fishing, protecting our cultural heritage. That's what the American public is asking us to do." http://www.pbs.org/newshour/bb/fedagencies/jan-june98/road_6-19.html **Review: Not Relevant to the Project** *In these transcripts from the Newshour with Jim Lehrer, the panel of participants discussed the potential impacts that an 18th month moratorium on road building in unroaded areas would have on the logging industry. The Idaho congressional delegation and industry representatives believe that the moratorium is political and will lead to locking up the national forests from timber harvest. Chief Dombeck's statement points out that timber harvest needs to be considered along with other uses. The Flint Foothills Vegetation Management Project does not propose road building in unroaded areas.*
4	**Dombeck, Mike, Ph.D. USDA Forest Service Chief. From a message on "Conservation Leadership" sent to all USDA FS employees on July 1, 1998.** "I recently read a letter from a line officer who chided local managers for being behind schedule relative to meeting the region's 'timber targets.' My expectation is that line officers will demand similar accountability for meeting watershed restoration, fish and wildlife habitat, riparian, recreation, cultural resource, and wilderness management goals." "We need to do a better job talking about, and managing for, the values that are so important to so many people. Values such as wilderness and roadless areas, clean water, protection of rare species, old growth forests, naturalness – these are the reasons most Americans cherish their public lands."

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	"Fifty years ago, Aldo Leopold wrote his seminal work, A Sand County Almanac. In it, Leopold spoke of his personal land ethic and the need for land managers to extend their own ecological conscience to resource decisions. The Forest Service natural resource agenda is an expression of our agency's land ethic. If we are to redeem our role as conservation leaders, it is not enough to be loyal to the Forest Service organization. First and foremost, we must be loyal to our land ethic. In fifty years, we will not be remembered for the resources we developed; we will be thanked for those we maintained and restored for future generations." http://www.wvhighlands.org/VoicePast/VoiceAug98/Dombeck.Aug98.html **Review: Not Relevant to the Project** *This is a message from then-Chief Mike Dombeck sharing his view with the National Leadership Team on what makes a "conservation leader" in the context of his natural resource agenda. It is not specific to any laws, regulations or policies that would be pertinent to the Flint Foothills analysis.*
4	**Dombeck, Mike, Ph.D. 2006. "Politics vs. Science" October 19, 2006 Published by the University of Wisconsin, Board of Regents. (Statements)** "The responsible policy maker ought to seek out the best science, because ultimately that will yield the best result.". "To put things in perspective, Dombeck says, "Science should not be the only driver of policy; there are economic, social and political concerns, but ... scientists can provide information that informs policymaking; 'If we adopt this policy, this will be the outcome,' and that certainly does not appear to be happening." " http://whyfiles.org/247sci_politics/index.php?g=5.txt **Review: Not Relevant to the Project** *The excerpt provided here is the retired Chief's response when asked why the government should fund research when it might not be in line with the government's political interest. At the time Dombeck was a professor of global environmental management at the University of Wisconsin-Stevens Point. He goes on to say that policy makers should seek out the best science to yield the best result, though his comment was not specific to the Flint Foothills Vegetation Management project. The Flint Foothills analyses consider the latest and best science available; over 100 references are cited in the analyses.*
1	**Drennan, J. and R. Beier. 2003. "Forest structure and prey abundance in winter habitat for northern goshawks." J. Wildlife Management 67:177-185.** **http://oak.ucc.nau.edu/pb1/vitae/Drennan-Beier-2003.pdf** As related to letter 1, comment 35; additional literature to address **Review: Relevant to the Project** *This published, peer-reviewed paper investigates movement, habitat structure, and prey associations for goshawks in north-central Arizona during*

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	the winter. Results of this study showed that goshawks within their study area were largely non-migratory, whereas the study describes more northerly birds as migratory in response to prey declines.
4	**Drever, Ronnie Ph.D. and Josie Hughes. 2001. "Salvaging Solutions: Science-based management of BC's pine beetle outbreak" A report commissioned by the David Suzuki Foundation, Forest Watch of British Columbia (a project of the Sierra Legal Defence Fund), and Canadian Parks and Wilderness Society – B.C. Chapter.** "On the basis of this review, we conclude that: "The mountain pine beetle and other bark beetles are native species and natural and important agents of renewal and succession in interior forests. Beetle outbreaks create diversity in forest structure, tree ages and species composition at stand and landscape scales, which are important for forest ecosystem health, diversity, and productivity. Beetle-killed trees provide ecological services and functions well beyond their death. At the landscape scale, beetle infestations create a mosaic of forest patches of various ages, densities, species composition and successional stages." "The current outbreak in central BC is a socio-economic challenge, rather than an ecological crisis. Mountain pine beetle outbreaks, like fire, are a natural disturbance to which interior forests are adapted and with which these forests have evolved for millennia." "Management interventions have never before controlled a large outbreak." "Sanitation and salvage clearcutting differ from natural disturbances in their effect on forest structure, and tend to reduce stand and landscape diversity. Natural disturbances vary in their intensity, frequency and magnitude, and amount and type of forest structure they retain. A large-scale clearcut is a stand replacement event that differs from a natural disturbance, especially in its intensity (percent of woody structures removed), frequency over time, and magnitude. Structural diversity at both the stand and landscape level is important for maintaining biodiversity and for the ability of ecosystems to resist and recover from fires, diseases, and other disturbances. Reducing stand and landscape diversity through harvesting may increase the susceptibility of these forests to large mountain pine beetle outbreaks in the future." "Current mountain pine beetle management fails to adequately ensure that ecological values are protected. The current legal framework allows 'emergency' exemptions from block-size requirements, terrain stability assessments, adjacency constraints and public review periods for operational plans. 'Emergency' logging may also occur in Old Growth Management Areas, Wildlife Habitat Areas, riparian reserves, Wildlife Tree Patches, Forest Ecosystem Networks, ungulate winter ranges, thus affecting the implementation of higher level planning, e.g., Land and Resource Management Plans." http://www.davidsuzuki.org/publications/downloads/2001/salvaging_solutions.pdf **Review: Not Relevant to the Project** *The document referenced is an assessment in how the British Columbia Ministry of Forests is managing the mountain pine beetle outbreak. Findings in the report include that the current outbreak in central BC is a socio-economic challenge; management interventions have never controlled a large outbreak; sanitation and salvage clearcutting differ from natural disturbances; allowable annual cuts in the beetle-affected area are too high; current MPB management fails to adequately ensure that ecological values are protected; design a planning process to ensure that environmental values are protected during sanitation harvests; and take an adaptive approach to MPB management. The Flint Foothill analysis*

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	does not state that there is an ecological crisis, and does not prescribe to the idea that management interventions can controlled a large outbreak. The analysis for this project does consider the differences in stand structure with natural disturbance and disturbance created by harvest; the magnitude of salvage by clearcut harvesting proposed with the project is about 6 percent of the project area, which allows for natural processes to occur over the majority of the area. Much of the linked document is specific to the laws and regulations for Canadian forests, and the resulting ecological ramifications of following the current management approach.
4	**Duncan, Sally Ph.D. "Postfire Logging: Is it Beneficial to a Forest?" USDA Forest Service. *PNW Science Findings* issue 47. October 2002.** "Trees killed by wildfire and left standing take on roles that change the ecological services they previously provided as components of a green-tree system. They still offer some shade, which in a burned environment can slow the heating of surface waters and the soil surface. They may also provide more rapid recruitment of large wood into streams. Decomposing fallen trees provide nutrients, shelter, and early structure for a rejuvenating forest floor." "Burned forests typically support significantly different bird communities, with many species dependent on stand-replacement fires to maintain their populations across the landscape. Usually there's an increase in cavity-nesting, insectivorous birds such as woodpeckers and certain species of flycatchers." http://www.fs.fed.us/pnw/sciencef/scifi47.pdf **Review: Relevant or Not Relevant to the Project** *This is an article that shares viewpoints both for and against post-fire logging; explains why "dead-tree harvest" levels increased dramatically in the 1990's; and what studies have been done to analyze the effects of post-fire logging. The Flint Foothills project proposes to thin and salvage dead and dying trees due to insect and disease infestations. It is not a post-fire project.*
4	**Dwyer, William. Federal Judge in his opinion text of Seattle Audubon Society v. Mosley, 798 F. Supp. 1484, 1489 (W.D. Wash. 1992)** "The Forest Service actions were a "systematic and deliberate refusal to comply with the nation's environmental laws." http://www.forestcouncil.org/learn/features/zerocut/mythfact.html **Review: Relevant or Not Relevant to the Project** *Judge Dwyer's statement is in reference to a 1991 lawsuit in the Pacific Northwest regarding the northern spotted owl. In general, the reference provided contains a combination of opinions and statistics ("myths" and "facts") from various organizations and agencies regarding logging national forests. Judge Dwyer's statement and the statements in the reference are not specific to the Flint Foothills Vegetation Management Project environmental analysis. The Flint Foothills project is in Montana, and not within the range of the northern spotted owl.*
4	**Eastern Forest Environmental Threat Assessment Center. U.S. Forest Service – Southern Research Station. Asheville NC. "Forest Fragmentation and Roads."** "Fragmentation caused by roads is of special interest because the effects of roads extend tens to hundreds of yards from the roads themselves,

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	altering habitats and water drainage patterns, disrupting wildlife movement, introducing exotic plant species, and increasing noise levels. The land development that follows roads out into rural areas usually leads to more roads, an expansion process that only ends at natural or legislated barriers." http://www.forestthreats.org/publications/su-srs-018/fragmentation **Review: Relevant to the Project** *This short summary of forest fragmentation and roads is presented at the national-scale. The effects of roads on wildlife and habitats is addressed in the DEIS wildlife section.*
1	**Ercelawn, A. 1999. End of the Road – The Adverse Ecological Impacts of Roads and Logging: A Compilation of Independently Reviewed Research. 130 pp. Natural Resources Defense Council. New York.** **http://www.nrdc.org/land/forests/roads/eotrinx.asp** As related to letter 1, comment 35; additional literature to address **Review: Relevant to the Project** *Chapter 4 of this website is titled Invasion by Harmful Exotic (non-Native) Plants and Animals. This chapter displays several articles discussing the invasion of nonnative species, how they spread into undisturbed areas and damages to ecosystem processes. The Invasive Plant Species section of the EIS agrees with many of the findings in this chapter. It discusses how roads are a vector of invasive species spread and establishment. It also discusses mitigation measures to help prevent invasive species spread and describes treatment successes in the past. This annotated bibliography provides an overview of primary research, almost all from peer-reviewed journals, documenting the adverse impacts of roads and logging on North American forest ecosystems. Though broad in coverage, there are portions of effects discussion that are relevant, therefore this document is considered in the project analysis. The reference contains a literature summary of key findings pertaining to road impacts to a number of species in a variety of geographic locations. The impacts of roads on streams are acknowledged and the Flint Foothills Project includes BMP maintenance on existing roads to reduce sedimentation impacts to streams and aquatic resources. Pertinent and applicable references are considered in the Flint Foothills wildlife analysis.*
1	**Ercelawn, A. 2000. Wildlife Species and Their Habitat: The Adverse Impacts of Logging – A Supplement to End of the Road. 41 pp. Natural Resources Defense Council. New York.** **http://www.nrdc.org/land/forests/eotrsupp.asp** As related to letter 1, comment 35; additional literature to address **Review: Relevant to the Project** *The reference contains a summary of reported findings associated with habitat studies where habitat impacts could occur as a result of logging.*

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	Summaries were generated for a variety of species in a variety of geographic locations. Pertinent and applicable references will be considered in the Flint Foothills wildlife analysis.
4	**Ehrlich, Anne Ph.D., David Foster Ph.D. and Peter Raven Ph.D. 2002. "Call to End Logging Based on Conservation Biology." Native Forest Network.** "For much of the past century the Forest Service, entrusted as the institutional steward of our National Forests, focused its management on an industrial-scale logging program. The result of the massive logging and road construction program was to damage watersheds, destroy wildlife habitat and imperil plant and animal species." http://www.nativeforest.org/campaigns/public_lands/stb_5_30_02.htm **Review: Not Relevant to the Project** *In 2003, 221 PhD-level scientists signed a letter to President Bush urging him to end commercial logging and road construction in National Forests and invest in forest restoration. They believe that protecting national forests creates more economic benefits than continued logging and advocate a shift in federal funding of the timber sale program into a program that pays local contractors to restore national forests. The authors' recommendations regarding the Federal timber sale program are not specific to the Flint Foothills project's site-specific environmental analysis.*
4	**Environmental Literacy Council. 2008. Forest Fires** "Wildfires are a natural occurrence and serve important ecosystem functions. Forest landscapes are dynamic and change in response to variations in climate and to disturbances from natural sources, such as fires caused by lightning strikes. Many tree species have evolved to take advantage of fire, and periodic burns can contribute to overall forest health. Fires typically move through burning lower branches and clearing dead wood from the forest floor which kick-starts regeneration by providing ideal growing conditions. It also improves floor habitat for many species that prefer relatively open spaces." http://www.enviroliteracy.org/article.php/46.html **Review: Not Relevant to the Project** *The article talks about wildfire, its role in ecosystem function, the consequences of past fire suppression and the resulting build-up of fuels, and the importance of balancing periodic fires and containment measures. The article is from a set of "teaching materials" on controlled burns. We agree with the statement information provided in the article and the Flint Foothills analysis discusses fire as a disturbance agent. The project, however, is not tied to wildfire and fire containment.*
4	**EPA entry into the Federal Register: March 3, 2000 (Volume 65, Number 43) Page 11675, "National Forest System Road Management."** "Few marks on the land are more lasting than roads." "The negative effects on the landscape of constructing new roads, deferring maintenance, and decommissioning old roads are well documented. Unwanted or non-native plant species can be transported on vehicles and clothing by users of roads, ultimately displacing native species. Roads

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	may fragment and degrade habitat for wildlife species and eliminate travel corridors of other species. Poorly designed or maintained roads promote erosion and landslides, degrading riparian and wetland habitat through sedimentation and changes in streamflow and water temperature, with associated reductions in fish habitat and productivity. Also, roads allow people to travel into previously difficult or impossible to access areas, resulting in indirect impacts such as ground and habitat disturbance, increased pressure on wildlife species, increased litter, sanitation needs and vandalism, and increased frequency of human-caused fires." http://www.epa.gov/fedrgstr/EPA-GENERAL/2000/March/Day-03/g5002.htm **Review: Not Relevant to the Project** *This is an excerpt from a March 3, 2000 Federal Register notice posted by the Forest Service. The Forest Service concluded that it needed to review its forest road system policy, one of four emphasis items in the agency's National Resource Agenda. The Agency proposed to revise 36 CFR Part 212 to shift the emphasis from transportation development to managing environmentally sound access. The Forest Service invited written comments to consider in development of the final rule and final administrative policy. This Federal Register notice does not have any direct bearing on the Flint Foothills Vegetation Management Project analysis. Road maintenance work would be conducted, where needed, on roads that would be used to haul timber to reduce sediment delivery to streams and would follow all agency policy. Temporary roads would be decommissioned at the conclusion of the authorized in line with agency policy.*
4	**Fahnestock, G.R. 1968. "Fire hazard from pre-commercially thinning ponderosa pine." Research Paper 57, USDA, Forest Service** "Fresh, dry slash of any species makes a high-intensity, unapproachable fire. A fire started in dry, fresh slash can become uncontrollable in seconds." (pg.12) "It appears significant that many large fires in the western United States have burned almost exclusively in slash. Some of these fires have stopped when they reached uncut timber; none has come to attention that started in green timber and stopped when it reached a slash area." (pg. 14) http://www.fs.fed.us/pnw/pubs/journals/pnw_1968_fahnestock001.pdf **Review: Not Relevant to the Project** *The Flint Foothills Project does not propose leaving untreated slash in the project area.*
4	**Federal Register / Vol. 69, No. 188, page 58056 Wednesday, September 29, 2004 Rules and Regulations** "The purpose of this interpretative rule is to clarify that, both for projects implementing plans and plan amendments, paragraph (a)'s mandate to use the best available science applies." http://www.fs.fed.us/r1//projects/plan_rule/intrpretative-rule.pdf **Review: Relevant Relevant to the Project** *This excerpt is from a Federal Register notice on 36 CFR part 219, National Forest System Land and Resource Management Planning; clarifying*

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	the intent of the transition section of the planning regulations concerning the use of the best available science in implementing land management plans. The notice is not specific to the Flint Foothills Vegetation Management Project, though the policy to use best available science is applied. The project's analyses cite over 100 references.
1	**Fire Effects Information System** "As a disturbance process, fire has the potential to greatly exacerbate infestations of certain noxious weed species, depending on burn severity and habitat type (Fire Effects Information System 2004)" http://www.fs.fed.us/database/feis/ **Review: Relevant to the project** *I assume the reference is referring to the document titled, Wildland Fire in ecosystems: fire and nonnative invasive plants. If so, this document is a review of information on relationships between wildland fire and nonnative invasive plants. This document synthesize ecological and botanical principles regarding relationships between wildland fire and nonnative invasive plants, identify the nonnative invasive species currently of greatest concern in major bioregions of the United States, and describe emerging fire-invasive issues in each bioregion and throughout the nation. This document was referenced in order to develop the Invasive Species portion of the DEIS. Chapter 8, Fire and Nonnative Invasive Plants in the Interior West Bioregion, provided excellent information for Western Montana.*
4	***Forest Conservation News Today*, August 27, 2002. "Bush Fire Policy: Clearing Forests So They Do Not Burn"** "The Bush administration has announced plans to greatly increase logging on federal lands in order to reduce the risk of wildfires. The Forest Service is using the fear of wildfires to allow logging companies to remove medium-and large-diameter trees that they can sell, rather than just the small trees and brush that can make fires more severe. There is little evidence to show that such logging will prevent catastrophic fires; on the contrary, logging roads and industrial logging cause wildfires. Bush is a well-known supporter of the timber industry and has accepted huge sums of money from wealthy timber company leaders. He is promoting misinformation about forest fires in order to benefit timber industry campaign contributors." http://forests.org/archived_site/today/recent/2002/tiporefl.htm **Review: Not Relevant to the Project** T*he article is an opinion piece and not a peer reviewed scientific study on President Bush's plan to "greatly increase logging on federal lands in order to reduce the risk of wildfires" (likely meaning the Healthy Forest Initiative).The commentary purports that Bush is providing misinformation to gain campaign contributions from the timber industry. The Flint Foothills Project purpose and need does not include an objective to reduce the risk of wildfire.*
4	**Forests.org. Portland Independent Media Center. Overview & Commentary, July 20, 2002** "It is well known scientifically that "commercial logging actually increases fire severity by removing large, fire- resistant trees and leaving behind very

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	small trees and flammable "slash debris"–branches, twigs and needles from felled trees. The removal of mature trees also decreases the forest canopy, creating hotter, drier conditions on the ground. The additional sun exposure encourages the growth of flammable brush and weeds. Reduction of flammable underbrush can reduce fire severity, and environmental groups have encouraged such projects. However, the Bush administration has grossly misused the funds that Congress appropriated for brush reduction near homes. In Sierra Nevada national forests last year, more than 90% of these funds were instead earmarked for preparation of large timber sales focused on the removal of mature and old-growth trees miles from the nearest town." "'The Forest Service, Bush administration and anti-environmental members of Congress are spreading a great deal of misinformation about wildfire, hoping to capitalize on public fire hysteria and minimize public opposition to increased logging and roadbuilding in our national forests," said Jake Kreilick of the National Forest Protection Alliance based in Missoula, Montana. "With virtually all new timber sales couched in terms of 'reducing fuels' or 'restoring forest health,' fire hysteria has emerged as the driving force behind the Forest Service's logging program and the administration's efforts to 'streamline' our nation's environmental laws,'" Kreilick said. http://portland.indymedia.org/en/2002/08/17464.shtml **Review: Not Relevant to the Project** *The citation is an opinion piece and not a scientifically peer reviewed study. The citation references the effects of logging and/or fuels treatment on wildfire risk and severity reduction. The Flint Foothills Project purpose and need does not include a reduction in the risk or severity of wildfire.*
4	**Forman, Richard T. and Lauren E. Alexander "Roads and their Major Ecological Effects" Annual Review of Ecology and Systematics, Vol. 29: 207-231, November 1998.** "A huge road network with vehicles ramifies across the land, representing a surprising frontier of ecology. Species-rich roadsides are conduits for few species. Roadkills are a premier mortality source, yet except for local spots, rates rarely limit population size. Road avoidance, especially due to traffic noise, has a greater ecological impact. The still-more-important barrier effect subdivides populations, with demographic and probably genetic consequences. Road networks crossing landscapes cause local hydrologic and erosion effects, whereas stream networks and distant valleys receive major peak-flow and sediment impacts. Chemical effects mainly occur near roads. Road networks interrupt horizontal ecological flows, alter landscape spatial pattern, and therefore inhibit important interior species. Thus, road density and network structure are informative landscape ecology assays. Australia has huge road-reserve networks of native vegetation, whereas the Dutch have tunnels and overpasses perforating road barriers to enhance ecological flows. Based on road-effect zones, an estimated 15–20% of the United States is ecologically impacted by roads." http://arjournals.annualreviews.org/doi/abs/10.1146/annurev.ecolsys.29.1.207?cookieSet=1&journalCode=ecolsys.1 **Review: Not Relevant to the Project** *The quoted section above is an abstract from this paper. Many of the effects discussed in this paper are those associated with paved, well-maintained, high-speed roads. However, it is recognized that lower-standard, unpaved Forest roads have effects as well. The effects of*

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	displacement and avoidance were addressed in the Forest Plan and provides wildlife secure habitat through management of open motorized road and trail densities. This direction is discussed in the Flint Foothills wildlife analysis. A couple of other effects discussed in the paper include potential for roadkill and barrier effects. The potential for roadkill as a result of this project is low, as only 7.2 miles of temporary road would be constructed, they would not be open to the public, and would be very low standard, low speed roads. Hauling on other roads has little potential as well, due to the rough (and low speed) nature of the roads. The paper states that road width and traffic density are major determinants of the barrier effect of roads. The temporary roads proposed under this project would be narrow, have little traffic and would be obliterated after use. The potential for these roads to be barriers to wildlife movement is low as discussed in the wildlife section of the DEIS.
4	**Fox, Joseph W., Ph.D. and Timothy Ingalsbee, Ph.D. "Fuel Reduction for Firefighter Safety." Published in the Proceedings of the International Wildland Fire Safety Summit. Winthrop, WA, Oct. 26-29, 1998.** "We question the assumption that canopy fuel reduction through commercial thinning is necessary or sufficient for reducing wildfire hazards and/or introducing prescribed fire. We cite evidence that logging-induced changes in fuel composition, vegetation, and microclimate can result in increased rate of fire spread, higher fireline intensity, and more severe fire effects. This, in turn, can affect firefighter safety and efficiency, and inflate suppression costs. Instead, treatment of surface and ladder fuels through prescribed fire combined with manual pre-treatments (for example, non-commercial thinning, pruning, and hand-piling) can effectively reduce the risk of crownfires, increase firefighter safety, and improve ecosystem health. These methods also promise employment opportunities for wildland firefighters and other forest workers." http://www.fire-ecology.org/research/fuel_reduction.htm **Review: Not Relevant to the Project** *We do not put forth the assumption that canopy fuel reduction through commercial thinning is necessary or sufficient to reduce wildfire hazards or introduce prescribed fire.The citation references the effects of commercial thinning on "wildfire hazards". The purpose and need does not include an objective to reduce the risk of crown fires, fireline intensity, or severity of wildfire.*
4	**Franklin, Jerry Ph.D., David Perry Ph.D., Reed Noss Ph.D., David Montgomery Ph.D. and Christopher Frissell Ph.D. 2000. "Simplified Forest Management to Achieve Watershed and Forest Health: A Critique."** "The proposition that forest values are protected with more, rather than less logging, and that forest reserves are not only unnecessary, but undesirable, has great appeal to many with a vested interest in maximizing timber harvest. These ideas are particularly attractive to institutions and individuals whose incomes depend upon a forest land base." "On the other hand, approaches that involve reserving of a portion of the land base, or harvest practices that leave commercially valuable trees uncut to achieve ecological goals, are often considered much less desirable as they reduce traditional sources of timber income." http://www.coastrange.org/documents/forestreport.pdf **Review: Relevant to the Project** *This document offers a perspective on whether cutting trees can help protect forest values. It is part of an ongoing debate about the role of*

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	silviculture in management and restoration.
4	**Franklin, Jerry F. Ph.D. and James K. Agee Ph.D. "Forging a Science-Based National Forest Fire Policy." Issues in Science and Technology Fall 2003.** "Natural forest disturbances, including fire, kill trees but remove very little of the total organic matter. Combustion rarely consumes more than 10 to 15 percent of the organic matter, even in stand-replacement fires, and often much less. Consequently, much of the forest remains in the form of live trees, standing dead trees, and logs on the ground. Also, many plants and animals typically survive such disturbances. This includes living trees, individually and in patches." "These surviving elements are biological legacies passed from the pre-disturbance ecosystem to the regenerating ecosystem that comes after. Biological legacies are crucial for ecological recovery. They may serve as lifeboats for many species, provide seed and other inocula, and enrich the structure of the regenerated forest. Large old trees, snags, and logs are critical wildlife habitat and, once removed, take a very long time to replace." http://inr.oregonstate.edu/download/forging_a_science_based_national_forest_fire_policy.pdf **Review: Not Relevant to the Project** *The excerpt is from a paper discussing the need for a comprehensive national forest fire and fuels policy grounded on scientific principles and data that considers all aspects of wildfire management—managing fuels, fire suppression, and post fire salvage and restoration. The citation references the effects of logging as part of fuels treatment on wildfire risk reduction. The Flint Foothills project is planned under current law, regulation and policy. The proposed action calls for harvest of dead and dying lodgepole pine affected by mountain pine beetle. The Flint Foothills Project purpose and need does not include an objective to reduce the risk of wildfire.*
4	**Franklin, Jerry F. Ph.D. and James K. Agee Ph.D. "Forging a Science-Based National Forest Fire Policy." Issues in Science and Technology 2007.** "The scientific consensus is that large and old trees should generally be retained, especially fire-resistant species such as pines. Indeed, from an ecological perspective these are absolutely the last trees that should be removed. Large and old trees are the most likely to survive a fire and subsequently serve as focal points for recovery. Large and old trees are also critical wildlife habitat, in part because they are the source of the standing dead trees (snags) and logs where animals live. Large old trees are essentially irreplaceable because they take centuries to reach that state." "Logging as a part of fuel treatment programs is an issue that deserves serious consideration by everyone in the forest fire policy debates. On the one hand, traditional commercial logging operations are unlikely to improve fuel loadings significantly or alter potential fire behavior for the better. Such operations are not focused on the key ground and ladder fuels, and they also contribute additional ground and ladder fuels in the form of debris called slash." http://www.issues.org/20.1/franklin.html

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	Review: Not Relevant to the Project *The excerpt is from a paper discussing the need for a comprehensive national forest fire and fuels policy grounded on scientific principles and data, that considers all aspects of wildfire management, not just managing fuels, fire suppression and post-fire salvage. The authors state that this policy "needs to deal with long-term management of fuels and wildfire and consider the full range of ecological and social values, including issues related to forest health and the well-being of communities and people." The Flint Foothills project is planned under current law, regulation and policy. The proposed action includes thinning old-growth understory to promote large, overstory ponderosa pine and Douglas-fir trees; and underburning in other treated stands to reduce understory vegetation. The purpose and need for the Flint Foothills Project does not include an objective to reduce fuels.*
4	**Frey, David "Logging Won't Halt Beetles, Fire, Report Says" NewWest.net, 3-03-10.** "The authors warned that cutting roads into current roadless areas could bring much more harm to wildlife, soil and fisheries than the beetle-killed trees pose to the forest." http://www.newwest.net/topic/article/logging_wont_halt_beetles_fire_report_says/C41/L41/ **Review: Not Relevant to the Project** *The excerpt is from an article reporting on a report by an Oregon-based conservation group, National Center for Conservation Science and Policy, which states efforts to log beetle-killed trees won't reduce fire risk or beetle outbreaks. The report authors encourage fuels project be focused around the edges of communities. The Flint Foothills Project purpose and need does not include an objective to reduce fire risk, or to reduce beetle outbreaks, and does not propose road building or vegetation management in current roadless areas.*
1	**Frissell, C. A. and D. Bayles. 1996. "Ecosystem Management And The Conservation Of Aquatic Biodiversity And Ecological Integrity." American Water Resources Association. *Water Resource Bulletin*. Vol. 32. No. 2. August 1996.** "If natural disturbance patterns are the best way to maintain or restore desired ecosystem values, then nature should be able to accomplish this task very well without human intervention (Frissell and Bayles, 1996). " http://www.landsinfo.org/ecosystem_defense/Science_Documents/Frissell_Bayles_1996.pdf **Review: Not Relevant to the Project** *This article appears to be an opinion piece about the need to maintain watershed reserves and is not applicable specifically to the Flint Foothills Project.*
4	**Furniss, Michael J., Michael Love Ph.D. and Sam A. Flanagan "Diversion Potential at Road-Stream Crossings." USDA Forest Service. 9777 1814—SDTDC. December 1997.** "Rarely can roads be designed and built that have no negative impacts on streams. Roads modify natural drainage patterns and can increase

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	hillslope erosion and downstream sedimentation. Sediments from road failures at stream crossings are deposited directly into stream habitats and can have both on-site and off-site effects. These include alterations of the channel pattern or morphology, increased bank erosion and changes in channel width, substrate composition, and stability of slopes adjacent to the channels." "All of these changes result in important biological consequences that can affect the entire stream ecosystem. One specific example involves anadromous salmonids, such as salmon and steelhead that have complex life histories and require suitable stream habitat to support both juvenile and adult life stages." "A healthy fishery requires access to suitable habitat that provides food, shelter, spawning gravel, suitable water quality, and access for upstream and downstream migration. Road-stream crossing failures have direct impacts on all of these components." http://www.stream.fs.fed.us/water-road/w-r-pdf/diversionpntl.pdf **Review: Relevant to the Project** *This article has been peer-reviewed, and looks at the potential for streams to be diverted onto roads. Stream crossings frequently have the potential to divert streams from their channel if the capacity of the crossing structure is exceeded. Road-stream crossings with diversion potential typically pose much greater overall sedimentation risks than those without diversion potential. Designing roads to avoid diversion potential is straightforward, and remediating existing crossings to correct diversion potential is usually inexpensive. A proposed haul route stream crossing in Alternative 2 will be designed to accommodate larger stream flows and reduce the risk of culvert failure and stream diversion (DEIS pageXXX) on to the road. Other crossings have been evaluated for sedimentation. Stream diversion potential as a result of the project is low for most streams in the project area because haul roads used for the project will be maintained, and have been designed to reduce diversion potential. Some risks do exist however with all roads. Very high flows in the summer of 2011 led to stream diversion in Upper Douglas Creek, causing massive erosion of the Douglas Creek Road. Efforts to maintain and design roads will be made as part of this project to avoid future road problems. BMPs will be used on roads used for this project that are demonstrated to be effective at reducing sediment derived from roads, and reducing the amount of connectedness between roads and streams. Analysis to aquatic species and habitat is discussed in the EIS.*
1	**Gabler, K., J. Laundre, and L. Heady. 2000. "Predicting the suitability of habitat in southeast Idaho for pygmy rabbits." J. Wildlife Manage. 64:759-764.** As related to letter 1, comment 35; additional literature to address **Review: Not Relevant to the Project** *This is a published paper that developed a GIS model for pygmy rabbit habitat in southeastern Idaho, which may be useful for predicting areas that are unsuitable for pygmy rabbits. The Flint Foothills Project area is located well north of the known distribution of pygmy rabbits. In addition, proposed activities are located outside potential pygmy rabbit habitats.*
4	**GAO. 1999. "Western National Forest, A Cohesive Strategy is needed to Address Catastrophic Wildfire Threats." GAO/RCED-99-65.** "Most of the trees that need to be removed to reduce accumulated fuels are small in diameter and have little or no commercial value." "Mechanically removing fuels (through commercial timber harvesting and other means) can also have adverse effects on wildlife habitat and water

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	quality in many areas. Officials told GAO that, because of these effects, a large-scale expansion of commercial timber harvesting alone for removing materials would not be feasible. However, because the Forest Service relies on the timber program for funding many of its activities, including reducing fuels, it has often used this program to address the wildfire problem. The difficulty with such an approach, however, is that the lands with commercially valuable timber are often not those with the greatest wildfire hazards." http://www.gao.gov/archive/1999/rc99065.pdf **Review: Not Relevant to the Project** *This report to Congress discusses fuel management and notes that the roles and responsibilities of the Federal and State governments in fire protection may be subject to further debate. The proposed action calls for harvest of dead and dying lodgepole pine affected by mountain pine beetle. The Flint Foothills Project purpose and need does not include an objective for fuel treatment or reduction. Slash created through harvest activities would be mitigated through whole tree yarding at central landing sites*
1	**Gedney, D. D. Azuma, C. Bolsinger, and N. McKay. 1999. Western Juniper in eastern Oregon. USDA Forest Service. Pacific Northwest Research Station. General Technical Report PNW-GTR-464.** As related to letter 1, comment 35; additional literature to address **Review: Not Relevant to the Project** *This published report analyzes and summarizes a 1988 inventory of western juniper (Juniperus occidentalis Hook.) in eastern Oregon. There is no western juniper within the project area.*
4	**Gerein, Keith "Notorious pine beetle may be misunderstood" *The Edmonton Journal,* March 21, 2009** "Scourge. Epidemic. Pest. All are words often used to describe the pine beetles currently wreaking havoc across large tracts of North America's forests. Yet nature is too complex for good-versus-evil characterizations, says Cameron Currie, an Edmonton-born scientist whose recent work has discovered a potential upside to the notorious bugs. While the pine beetle's power to destroy has been well-documented, it may also have the power to heal. Currie's research discovered the insect is associated with a bacterium containing an antibiotic compound that could eventually lead to new life-saving medicines." (Pg. 9) http://www.chetwyndecho.net **Review: Not Relevant to the Project** *This link takes one to the Chetwynd Echo, not the Edmonton Journal. The excerpt is from a March 27,2009 newspaper article in the Chetwynd Echo titled Mountain pine beetle could carry power to heal that focuses on symbiotic relationships between insects and other organisms. The mountain pine beetle is one example in the article. The Flint Foothills Project proposes to harvest the dead and dying host (lodgepole) and not the mountain pine beetle.*

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4	**Giuliano, Jackie Alan, Ph.D. "Fire Suppression Bush Style: Cut Down the Trees!" *Environment News Service*, 2008.** "But the majority of the protesters were angry about Bush's plans to implement rules that would thin our national forests to reduce fire risk. Cascadia Forest Alliance volunteer Carrie Taylor said Bush's plan to log mature and old forests "will only increase fire risks while providing taxpayer subsidized logs to the timber industry." "According to the Cascadia Forest Alliance, under the Bush proposal, 'environmental laws and citizen involvement will be undermined or suspended so that federal land management agencies can increase logging and roadbuilding on public lands, one of the timber industry's highest priorities.'" http://www.ens-newswire.com/ **Review: Not Relevant to the Project** *The excerpt is from an article reporting on a past protest in Portland, Oregon, over then- President's Bush's' forest policies, specifically " plans to implement rules that would thin our national forests to reduce fire risk." While the Flint Foothills Project does propose precommercial and commercial thinning, it is not a fuels reduction project and does not include an objective to reduce fire risk.*
4	**Glickman, Dan. Agriculture Secretary. 1999. From an Announcement of Interim Ban on Forest Road Construction Washington, D.C., February 11, 1999** "Our challenge is to protect all the different uses of our forests which well-kept roads undoubtedly serve while protecting these remaining untouched places. This is a long and delicate process. It will not happen overnight. We must rely on the best science and broad-based public participation. But in the interim, I am prepared to authorize an 18-month moratorium on the construction of new roads in the last pristine areas of our national forests." http://www.usda.gov/news/releases/1999/02/0056 **Review: Not Relevant to the Project** *This excerpt is from an introduction to Chief Mike Dombeck on the interim ban on forest road construction in certain unroaded areas while the Forest Service develops a revised road management policy. The Flint Foothills Project does not propose construction of roads into roadless areas. It does consider the latest and best science available—over 100 references are cited in the analyses.*
4	**Gorte, Ross W. Ph.D. "Forest Service Timber Sale Practices and Procedures: Analysis of Alternative Systems." A Congressional Research Service (CRS) report, October 30, 1995.** "The recent concern over the poor health of western pine ecosystems has been attributed at least partly to inappropriate silvicultural practices, both before and since the national forests were established. (4) Because of the timber industry's needs, logging in mixed conifer stands has emphasized cutting the large pines and leaving the true firs and Douglas-fir to dominate the remaining stands. (5) However, true firs and Douglas-fir are more susceptible to the damage (including insect and disease attacks as well as direct damage) that has occurred during the decade-long drought in the interior West, and thus may contribute to the risk of catastrophic wildfires. Salvage sales are one tool that can be used to improve forest health, (6)

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	but critics object to granting the agency the discretion to use timber sales to correct problems partially created by past timber sales." "A more general concern in some quarters is over Forest Service "bias" toward timber outputs, at the expense of ecosystem conditions and other resource values. While timber harvests are important, other important values are not measured, and managers are not rewarded for achieving these other values. (7) Some have attributed this "bias" to inappropriate incentives, particularly related to the agency's numerous trust funds and special accounts. (8) The Forest Service has several trust funds and special accounts that are either funded by timber revenues or provide funds for timber management (or both). (9)" "One trust fund often cited by critics is the Knutson-Vandenberg (K-V) Fund. This account receives an unlimited portion of timber sale receipts, to be used for reforestation, timber stand improvements, and other resource mitigation and enhancement activities in timber sale areas. Forest Service managers can, therefore, fund their programs from timber sales; in the words of one critic, wildlife managers have an incentive to support timber sales that damage wildlife habitat, because they can use the revenues to mitigate that damage and to keep themselves and their staffs employed. (10)" http://www.ncseonline.org/NLE/CRS/detail.cfm?do=do&OrderBy=Date&Category=Forests&CRScode=&Title=&Authors=&Keyword=&quickKeyword=&MaxCount=32&start=21 **Review: Not Relevant to the Project** *This report is an analysis and critique of the timber sale practices and procedures used by the Forest Service circa 1995 and analysis of alternatives to that system. Changes to the practices and procedures of the Forest Service timber sale system cannot be made or analyzed at the project level. The use of KV funds by the Forest Service is; FSH 2409.19 RENEWABLE RESOURCES HANDBOOK DIRECTION 13.0 Appropriate Use of CWKV Funds states that KV cannot be used to mitigate the effects of a timber sale.*
4	**Gorte, Ross W. Ph.D. from a CRS report for Congress, January 18, 2006.** "Research had documented that, in some situations, wildfires brought ecological benefits to the burned areas — aiding regeneration of native flora, improving the habitat of native fauna, and reducing infestations of pests and of exotic and invasive species." (pg 2) http://www.ncseonline.org/nle/crsreports/06Feb/RL30755.pdf **Review: Not Relevant to the Project** *This is a report to Congress concerning forestry practices, funding levels, and the federal role in wildland fire protection. It provides historical background on wildfires, and describes concerns about the wildland-urban interface and about forest and rangeland health. It discusses fuel management, fire control, and fire effects. The report then examines federal, state, and landowner roles and responsibilities in protecting lands and resources from wildfires. The purpose and need for the Flint Foothills project does not include an objective to manage fuels for future fire control, though post –logging fuels (slash) would be treated.*
4	**Grace, Johnny M. III Ph.D. 2003. "Minimizing the impacts of the forest road system." In: Proceedings of the conference 34 international erosion control association; ISSN 1092-2806. [Place of publication unknown]: International Erosion Control Association: 301-310.**

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	"Roads and skid trails have been identified as a major contributor to increased turbidity of water draining logging areas resulting in increases from 4 to 93 parts per million (Hoover, 1952). Forest roads have been found to have erosion rates from one to three orders of magnitude greater than similar undisturbed areas (Megahan, 1974) and perhaps account for as much as 90 percent of all forest erosion (Megahan, 1972). Forest roads can also cause soil erosion and stream sedimentation, which adversely impact on the nation's water quality (Authur et al., 1998). http://www.srs.fs.usda.gov/pubs/ja/ja_grace011.pdf **Review: Relevant to the Project** *This peer –reviewed government report looks at sediment control systems that minimized sediment travel distances downslope of roads and their effectiveness at reducing the environmental impact of road systems in the southeast U.S. Sediment basin, sediment fence, and vegetation treatments were all evaluated. A similar technique for sediment reduction called filter windows or their equivalent will be used at all stream crossings for this project, and these have been demonstrated to be over 80% effective at reducing sediment delivery to streams (Seyedbagheri, 1986).*
1	**Graham, Russell T. et al. 1999. "The Effects of Thinning and Similar Stand Treatments on Fire Behavior in Western Forests." United States Department of Agriculture, Forest Service, Pacific Northwest Research Station. United States Department of the Interior, Bureau of Land Management. General Technical Report PNW-GTR-463. September 1999.** "Please consider that tinning can result in faster fire spread than in the unthinned stand. Graham, et al., 1999 point out that fire modeling indicates: For example, the 20-foot wind speed must exceed 50 miles per hour for midflame wind speeds to reach 5 miles per hour within a dnese Stand (0.1 adjustment factor). In contrast, in an open stand (0.3 adjustment factor), the same midflame wind speeds would occur at only a 16-mile-per-hour wind at 20 feet. Graham, et al., 1999 also state: Depending on the type, intensity, and extent of thinning, or other treatment applied, fire behavior can be imporved (less severe and intense) or exacerbated."…Fire intensity in thinned stands is greatly reduced if thinning is accompanied by reducing the surface fuels created by the cuttings. Fire has been successfully used to treat fuels and decrease the effects of wildfires especially in climax ponderosa pine forests (Deeming, 1990; Wagel and Eakle 1979; Weaver 1955, 1957). In contrast, extensive amounts of untreated logging slash contributed to the devastating fires during the late 1800s and early 1900s in the inland and Pacific Northwest forests. In their conclusion, Graham, et al., 199a state: Depending on intensity, thinning from below and possibly free thinning can most effectively alter fire behavior by reducing crown bulk density, increasing crown base height, and changing species composition to lighter crowned and fie-adapted species. Such intermediate treatments can reduce the severity and intensity of wildfires for a given set of physical and weather variables. But crown and selection thinning would not reduce crown fire potential." http://www.fs.fed.us/r6/umpqua/projects/projectdocs/d-bug-ts/effects-of-thinning-on-fire-behavior-graham-et-al-1999.pdf **Review: Not Relevant to the Project** *This paper is one in a series of papers developed as background material for the Interior Columbia Basin Ecosystem management Project. It discusses the positive and negative effects that thinning has on crown fire potential. The quotes above are selective, as since the type of thinning done does make a difference (influences) to fire behavior. The Flint Foothills project proposes thinning from below; harvest treatments would be*

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	followed by underburning to reduce stand densities. The project does not have an obajective to reduce crown fire potential and the effects from thinning on fire behavior are not analyzed.
3	**Green P. J. Joy, D. Sirucek, W. Hann, A. Zack, and B. Naumann. 1992. "Old-Growth Forest Types Of The Northern Region." R-1 SES 4/92; USDA Forest Service, Northern Region, Missoula, MT** "Please define and map all of the old growth in the project by each old growth type per Green et al. 1992" **Review: Relevant to the Project** *The paper describes the process to classify old growth forests based on habitat types. The old growth types for the Northern Region were developed for three different geographic areas within the Region: northern Idaho, western Montana, and eastern Montana. The request to define and map all of the old growth in the project by each old growth type per Green et al 1992 is not necessary and will not be done. The Forest Plan Vegetation Standard (1) directs that mechanical vegetation treatments and prescribed fire in old-growth stands do not reduce the age and number of large trees and basal area below the 'minimum criteria' required in Green et al. The direction provided is an old growth retention requirement, which this project does retain all existing old growth, regardless of the number of acres of old growth currently in the project area; therefore an inventory of existing old growth is not required and will not be done.*
4	**Gregory, Lisa Dale. Ph.D. "Wildland Fire Use: An Essential Fire Management Tool" A Wilderness Society Policy and Science Brief. December 2004.** "Ecologists and fire experts unanimously agree that fire has served an essential role in certain ecosystems for millennia. The ecological benefits of fire include: the creation of critical wildlife habitat in standing dead trees, increased nutrients and productivity in soil systems when burned material decomposes, improved conditions for surviving old growth trees when a surface fire moves through a system, and the regeneration of some fire dependent trees like lodgepole pine (Pinus contorta). Fire also increases availability of other fundamental building blocks of ecosystems such as moisture and sunshine by opening up the canopy and returning nutrients to the soil. Natural fire cycles maintain the diversity of habitats available to all the species in the ecosystem, from wildlife to wildflowers to fungi." http://wilderness.org/files/wildland-fire-use-essential-tool.pdf **Review: Relevant or Not Relevant to the Project** *The quote above provided from the article accurately discusses the beneficial effects derived from fire, but the article that the quote is from is about wildland fire use, and the promotion of wildland fire use on National Forest lands. This project does have prescribed burning as a part of the proposal, but does not address wildland fire use, as this tool is already available to the entire Beaverhead-Deerlodge NF through the current Forest Plan decision.*
4	**Gucinski, Hermann Ph.D., Michael J. Furniss, Robert R. Ziemer Ph.D. and Martha H. Brookes, Editors. 2001. "Forest Roads: A Synthesis of Scientific Information." USDA Forest Service, General Technical Report PNW-GTR-509.** "Roads have well-documented, short- and long-term effects on the environment that have become highly controversial, because of the value society

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	now places on unroaded wildlands and because of wilderness conflicts with resource extraction." "(Road) consequences include adverse effects on hydrology and geomorphic features (such as debris slides and sedimentation), habitat fragmentation, predation, road kill, invasion by exotic species, dispersal of pathogens, degraded water quality and chemical contamination, degraded aquatic habitat, use conflicts, destructive human actions (for example, trash dumping, illegal hunting, fires), lost solitude, depressed local economies, loss of soil productivity, and decline in biodiversity." http://www.fs.fed.us/pnw/pubs/gtr509.pdf **Review: Relevant to the Project** *This GTR focuses on roads. Road work is generally limited to routes required to haul cut timber, or work to improve the ecological effects of existing roads. This is relevant to the project. PNW-GTR-509 describes the effects roads have on ecosystems. It is a companion paper to Roads Analysis: Informing Decisions about Managing the National Forest Transportation System (USDA Forest Service 1999a). The report details the known issues related to road impacts on physical and biological resources, road impacts at various scales, and the socio-economics of roads. The report then describes the known science surrounding these issues. The focus of the report is to help the reader understand how roads function in the landscape.* *The Flint Foothills Project addresses the impacts that roads have on the landscape. New permanent roads (1.3 miles) constructed with this project would be closed to public use. 7.2 miles of temporary road would be constructed to access commercial then decommissioned following use. Approximate 0.5 miles of newly constructed temporary roads would be within RCAs (riparian conservation areas). All roads, existing and temporary, would be managed and maintained in accordance with Forest Service Soil and Water Conservation Practices (BMPs).* *This peer-reviewed report looks at some of the broader effects of roads including effects on hydrology, turbidity and sedimentation. Roads have three primary effects on hydrologic processes: (1) they intercept rainfall directly on the road surface and road cutbanks and affect subsurface water moving down the hillslope; (2) they concentrate flow, either on the surface or in an adjacent ditch or channel; and (3) they divert or reroute water from paths it otherwise would take were the road not present. They also can erode the surface of the road, and transport sediment downstream to where it may enter streams. As part of this project, BMPs will be used to reduce sedimentation from roads.*
4	**H. R. 1494 text. April 4, 2001** "SEC. 3. FINDINGS. Congress finds the following: Commercial logging has many indirect costs which are very significant, but not easily measured, such as flooding damage and relief of flooding damage through Federal funds, damage to the salmon fishing industry; and harm to the recreation and tourism industries." http://www.agriculturelaw.com/legis/bills107/hr1494.htm **Review: Not Relevant to the Project** *Citation is language from a proposed 2001 bill -- `National Forest Protection and Restoration Act of 2001–before the House of Representatives that did not become law. The objectives of the bill were to "save taxpayers money, reduce the deficit, cut corporate welfare, protect communities from*

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	wildfires, and protect and restore America's natural heritage by eliminating the fiscally wasteful and ecologically destructive commercial logging program on Federal public lands, restoring native biodiversity in our Federal public forests, and facilitating the economic recovery and diversification of communities affected by the Federal logging program." The USDA Forest Service Strategic Plan: 2007-2012 includes goals and objectives to maintain health, productivity, diversity, and resistance to unnaturally severe disturbances and to provide a sustainable supply of goods and services, including wood fiber. The Flint Foothills Vegetation Management Project is consistent with the Strategic Plan. At the forest-level, the Flint Foothills project implements direction in the Beaverhead-Deerlodge Forest Plan.
4	**Haney, Alan Ph.D. Introduction to the keynote presentation of the 8th annual Wisconsin Association of Lifelong Learning conference. University of Wisconsin Stevens Point, October 25, 2007.** "In 2007, we are witnessing one of the "worst" wildfire years in recent history, as measured in acres burned, suppression costs, and loss of property. We tend to view loss of property or timber value, and aesthetics. This perspective was greatly promoted by the U.S. Forest Service and the highly successful Smokey the Bear campaign that continues, albeit much reduced. When examined from a more objective, ecological perspective, the benefits of wildfire greatly exceed the negatives. This illustrated presentation examines the ecology of wildfire and presents the case that our anthropocentric perspective often clouds a more balanced understanding of nature where even bears are benefactors of fire." http://www.uwsp.edu/conted/wall/conference.aspx **Review: Not Relevant to the Project** *The document was not available at the link provided. The quote provided above appears to focus on a particular fire season and the view of that fire season as being negative; rather, the author of the article likely discusses the benefits of wildfires. The Flint Foothills Project analysis neither includes a recent wildfire and its effects within the analysis area nor discloses in the analysis that there are negative effects from fire.*
4	**Hann, W.J. et al. 1997 "Landscape dynamics of the Basin." Pp. 337-1,055 in: Quigley, T.M. and S.J. Arbelbide (eds.) *An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins: Volume II.* USDA Forest Service, PNW-GTR-405** "Fires in the roaded areas are more intense, due to drier conditions, wind zones on the foothill/valley interface, high surface-fuel loading, and dense stands." http://www.fs.fed.us/pnw/pubs/gtr405/pnw_gtr405aa.pdf **Review: Not Relevant to the Project** *Cannot download the reference from address provided; only the abstract, preface, science team members, volume contents and acknowledgements are available at this link. The Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins provides detailed information about current conditions and trends for the biophysical and social systems within the Basin. There is no context tying the excerpt to the Flint Foothills Project.*

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4	**Hanson, Chad Ph.D., "Commercial Logging Doesn't Prevent Catastrophic Fires, It Causes Them." Published in the *New York Times*, May 19, 2000.** "In April 1999, the General Accounting Office issued a report that raised serious questions about the use of timber sales as a tool of fire management. It noted that "most of the trees that need to be removed to reduce accumulated fuels are small in diameter" – the very trees that have 'little or no commercial value.' " "As it offers timber for sale to loggers, the Forest Service tends to 'focus on areas with high-value commercial timber rather than on areas with high fire hazards,' the report said. Its sales include 'more large, commercially valuable trees' than are necessary to reduce the so-called accumulated fuels (in other words, the trees that are most likely to burn in a forest fire)." "The truth is that timber sales are causing catastrophic wildfires on national forests, not alleviating them. The Sierra Nevada Ecosystem Project Report, issued in 1996 by the federal government, found that 'timber harvest, through its effects on forest structure, local microclimate and fuel accumulation, has increased fire severity more than any other recent human activity.' The reason goes back to the same conflict that the G.A.O. found: loggers want the big trees, not the little ones that act as fuel in forest fires." "After a 'thinning' timber sale, a forest has far fewer of the large trees, which are naturally fire-resistant because of their thick bark; indeed, many of these trees are centuries old and have already survived many fires. Without them, there is less shade. The forest is drier and hotter, making the remaining, smaller trees more susceptible to burning. After logging, forests also have accumulations of flammable debris known as "slash piles" – unsalable branches and limbs left by logging crews." http://www.commondreams.org/views/051900-101.htm **Review: Not Relevant to the Project** *This is an opinion piece critical of the Forest Service's use of commercial thinning as a tool to reduce the risk of catastrophic wildfires, citing the Los Alamos fire; an escaped prescribed burn conducted by the National Park Service, as an example. The author claims that thinning is an excuse by the Forest Service to provide high-volume commercial timber to the timber industry. The citation provided references the effects of thinning treatments to reduce wildfire risk. While the Flint Foothills Project does propose commercial thinning, the project's purpose and need does not include an objective to reduce the risk of wildfire.*
4	**Hanson, Chad, Ph.D. "Logging for Dollars in National Forests" Special to *The Sacramento Bee* – November 14, 2001.** "The Forest Service keeps the vast majority of timber sale revenues, which gives it a perverse incentive to do more cutting. It has developed a huge bureaucracy around the selling of timber from national forest land." http://www.johnmuirproject.org/news-logging-for-dollars.html **Review: Not Relevant to the Project** *This is an opinion piece against post-fire logging in old-growth stands in northern California. The author states that salvaging is an excuse to cut otherwise off-limits old-growth forests. The article cites literature that concludes post-fire logging does not reduce fire intensity in previously logged*

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	stands and that leaving large dead wood does not significantly increase the probability of a reburn. This article oversimplifies slightly outdated information and selectively pulls from voluminous FS and external science to paint a biased picture that logging after forest disturbance has no benefit. The Flint Foothills Project is not a post-fire salvage project.
4	**Hanson, Chad Ph.D. "Logging Industry Misleads on Climate and Forest Fires." Guest Commentary in *New West*, July 11, 2008** "Recent editorials by timber industry spokespersons are a wildly misleading attempt to promote increased logging of western U.S. forests under the guise of reducing wildland fires …" http://www.newwest.net/topic/article/logging_industry_misleads_on_climate_and_forest_fires/C41/L41/ **Review: Not Relevant to the Project** *This commentary refutes timber industry claims that logging reduces wildfire risks and mitigates climate change. The author cites studies that support his points. The Flint Foothills Vegetation Management Project purpose and need does not include an objective to reduce the risk of wildfire.*
4	**Hanson, Chad Ph.D. "New Report Debunks Myth of 'Catastrophic Wildfire" February 4, 2010** "We do not need to be afraid of the effects of wildland fire in our forests. Fire is doing important and beneficial ecological work," said the report's author, Dr. Chad Hanson, a forest and fire ecologist and Director of the John Muir Project. "It may seem counterintuitive, but the scientific evidence is telling us that some of the very best and richest wildlife habitat in western U.S. forests occurs where fire kills most or all of the trees. These areas are relatively rare on the landscape, and the many wildlife species that depend upon the habitat created by high-intensity fire are threatened by fire suppression and post-fire logging." http://johnmuirproject.org/documents/Myth%20of%20Catastrophic%20Wildfire%20Media%20Release.pdf **Review: Not Relevant to the Project** *The reference consists of a media release containing author's comments concerning a summary interpretation of wildfire status and ecological effects. The Flint Foothills Project does not contain or propose to treat areas of severely burned forest. While the media release is not relevant to the Flint Foothills wildlife analysis, several references used in the summary document that refer to black-backed woodpecker habitats will be considered for the analysis.*
4	**Harvey, A. E., M. J. Larsen, and M. F. Jurgensen "Distribution of Ectomycorrhizae in a Mature Douglas-fir/larch Forest Soil in Western Montana" *Forest Science*, Volume 22, Number 4, 1 December 1976 , pp. 393-398(6)** "Logging reduces the organic parent material (duff and woody residues) available for soil-formation processes." http://www.ingentaconnect.com/content/saf/fs/1976/00000022/00000004/art00007;jsessionid=l2sdf2hphia2.alexandra **Review: Relevant to the Project** *This paper describes the mineral and organic composition of a soil developed from limestone parent material at a location 10 miles south of Glacier*

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	National Park in Montana. The authors measured active ectomycorrhizae associated with the various organic and mineral components of the soil, and found that five percent of the active ectomycorrhizae occurred in the mineral fraction, 66 percent in the humus, 21 percent in the decayed wood, and 8 percent in the charcoal. From this information, they conclude that soil organic matter is important in the formation and activity of ectomycorrhizae in Douglas fir/larch timber types found in Western Montana. They emphasize that their results should only be applied to mature forests and are not applicable to young or regenerating forests. The habitat type (Douglas fir/larch) in the paper is not present in the Flint Foothills project area. The need to provide for organic matter is recognized in the DEIS. Project design features include leaving 7-12 tons per acre of coarse woody debris, per the recommendations of Graham and others (1994), which are the guidelines cited in the Northern Region Soil Quality Standards (USDA Forest Service 1999).
1	**Harvey et al. 1994**. "**Biotic and Abiotic Processes in Eastside Ecosystems: The Effects of Management on Soil Properties, Processes and Productivity." USDA Forest Service. Pacific Northwest Research Station. GTR 323.** "Harvey et al., 1994 state: The ...descriptions of microbial structures and processes suggest that they are likely to provide highly critical conduits for the input and movement of materials within soil and between the soil and the plant. Nitrogen and carbon have been mentioned and are probably the most important. Although the movement and cycling of many others are mediated by microbes, sulfur phosphorus, and iron compounds are important examples. The relation between forest soil microbes and N is striking. Virtually all N in eastside forest ecosystems is biologically fixed by microbes... Most forests, particularly in the inland West, are likely to be limited at some time during their development by supplies of plant-available N. Thus, to manage forest growth, we must manage the microbes that add most of the N and that make N available for subsequent plant uptake. (Internal citations omitted.)" http://www.fs.fed.us/pnw/pubs/pnw_gtr323.pdf **Review: Relevant to the Project** *Harvey and others (1994) review the effects of management on soil properties, processes, and productivity for eastern Washington and Oregon soils. Topics for "eastside soils" covered include physical and chemical properties, organic matter, microbiology, fire, fertilizer application, and the influence of weather and stand on soil water use in ponderosa pine. Since the paper covers a different geographical area, the specific information presented on eastside soils such as ash-influenced soil properties are not applicable; however, general information/concepts presented, such as that found in the Microbial Ecology section quoted in your comment, are relevant to the Flint Foothills project. We agree that microbial processes are important mediators in nutrient cycling in soils. By following prescribed project design features to limit the amount of detrimental soil disturbance associated with project activities and meeting the soil quality standards, these microbial-mediated soil functions would be provided for.*
4	**Haskell, David G. Ph.D. 1999. "Effects of Forest Roads on Macroinvertebrate Soil Fauna of the Southern Appalachian Mountains"** "Many forested landscapes are fragmented by roads, but our understanding of the effects of these roads on the function and diversity of the surrounding forest is in its infancy. I investigated the effect of roads in otherwise continuous forests on the macroinvertebrate fauna of the soil. I took soil samples along transects leading away from the edges of unpaved roads in the Cherokee National Forest in the Southern Appalachian mountains of the United States. Roads significantly depressed both the abundance and the richness of the macroinvertebrate soil fauna. Roads

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	also significantly reduced the depth of the leaf-litter layer. These effects persisted up to 100 m into the forest. Wider roads and roads with more open canopies tended to produce steeper declines in abundance, richness, and leaf-litter depth, but these effects were significant only for canopy cover and litter depth. The macroinvertebrate fauna of the leaf litter plays a pivotal role in the ability of the soil to process energy and nutrients. These macroinvertebrates also provide prey for vertebrate species such as salamanders and ground-foraging birds. The effect of roads on the surrounding forest is compounded by the sprawling nature of the road system in this and many other forests. My data suggest that even relatively narrow roads through forests can produce marked edge effects that may have negative consequences for the function and diversity of the forest ecosystem." http://www.jstor.org/stable/2641904 **Review: Not Relevant to the Project** *The text above is directly copied from the abstract of the paper. This study took place in Tennessee, in the Southern Appalachian Mountains with hardwood tree species; a completely different ecosystem than that of the Flint Foothills project area. In summary, the author found that roads significantly depressed the abundance and diversity of macroinvertebrates, due to a reduction in leaf litter, or habitat. We do not inventory macroinvertebrates directly in field surveys; however, complying with the Northern Region Soil Quality Standards would limit litter layer disturbance within the proposed harvest units. Permanent system roads are not considered part of the productive soil base. Temporary roads associated with Alternative 2 and Alternative 3 would be decommissioned (bermed and signed closed) or obliterated after harvest operations are completed and would recover litter layers over time as stand regeneration occurs.*
4	**Hawbaker, Todd J. Ph.D., Volker C. Radeloff Ph.D., Murray K. Clayton Ph.D., Roger B. Hammer Ph.D., and Charlotte E. Gonzalez-Abraham Ph.D. "Road Development, Housing Growth, and Landscape Fragmentation In Northern Wisconsin: 1937–1999" Ecological Applications: Vol. 16, No. 3, pp. 1222-1237.** "Roads remove habitat, alter adjacent areas, and interrupt and redirect ecological flows. They subdivide wildlife populations, foster invasive species spread, change the hydrologic network, and increase human use of adjacent areas. At broad scales, these impacts cumulate and define landscape patterns." http://www.esajournals.org/doi/abs/10.1890/1051-0761%282006%29016%5B1222%3ARDHGAL%5D2.0.CO%3B2?journalCode=ecap **Review: Not Relevant to the Project** *This is a peer-reviewed article on a study that looked at the influence of road networks over time and their effects on landscape patterns in Northern Wisconsin and is not relevant to public lands and forests in Montana or the Flint Foothills Project.*
1	**Hessburg PF and Lehmkuhl JF. 1999. Results of a blind scientific peer review of the Wenatchee National Forest's Dry Forest Strategy and a case study of its implementation in the Sand Creek Ecosystem Restoration Project. USDA Forest Service, Pacific Northwest Research Station.** As related to letter 1, comment 35; additional literature to address

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	Review: Not Relevant to the Project A blind scientific peer review of the Wenatchee National Forest's Dry Forest Strategy and a case study of its application in the Sand Creek Ecosystem Restoration Project was conducted. General questions were posed with respect to the application of the "strategy" in the Sand Creek project; specific questions were posed with respect to fire disturbance, bark beetle disturbance, soils, and wildlife. This dry forest strategy is applicable in eastern Washington ecosystems.
1	**Holt, D. W., and J. M. Hillis. 1987. "Current status and habitat association of forest owls in western Montana." USDA Forest Service, Gen. Tech. Rep. RM-142, Ft. Collins, CO.** "With the exception of the Spotted Owl…, the U.S. Forest Service has not given much emphasis to owl management. This is contrary to the National Forest Management Act of 1976 (NFMA) which mandates that all wildlife species be managed for viable populations. However, with over 500 vertebrate species this would be difficult for any organization. Recognizing the absence of detailed information on owl habitat, the apparent association of owls with snags, mature, and old-growth timber (both rapidly declining), it seems inconsistent that the U.S. Forest Service has placed little emphasis on owl management. One might conclude that the agency's painful experiences with the Spotted Owl in Oregon and Washington have evolved into a 'hear no evil, see no evil' approach for other forest owls as well." **Review: Relevant to the Project** *The paper was presented at a symposium in 1987 and consists of a summary of owl species status and distribution in western Montana. The paper also stresses the need to gain more baseline information on forest-dwelling owls. The BDNF Forest Plan manages for viable populations of wildlife, including owls. Effects to flammulated owls and great gray owls are addressed in the wildlife section of the DEIS.*
4	**Houston, Alan Ph.D., "Why Forestry is in Trouble with the Public." *Evergreen Magazine,* October 1997.** "For too long, we foresters took the public for granted, assuming unwavering support for those who grow the nation's wood fiber. Few noticed when the public's mood changed, and those who did were often ridiculed by disbelieving colleagues. Now we come to a day of reckoning: the public believes forests are too important to be entrusted to foresters. To restore lost confidence, foresters must first come out of hiding. We have a lot of explaining to do because, where forests are concerned, the public will no longer support what it cannot see and understand. Regaining the public's trust will take time. We must be prepared to answer hard questions about what we are doing and how our actions are impacting the environment. We must also help the public think through its forest management options. When we lay out these options, we must speak of much more than trees. Only then will our critics know we love forests as much as they do." http://evergreenmagazine.com/web/Why_forestry_is_in_trouble_with_the_public-v2.html **Review: Relevant to the Project** *This quote presents an interesting perspective on the interaction between forestry scientists and the public. It addresses the ongoing emphasis to work with the interested public in partnership in managing national forests, including the debate about whether active forest management can lead*

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	to healthier forest conditions than passive management.
4	**Hudak, Mike Ph.D. "From Prairie Dogs to Oysters: How Biodiversity Sustains Us" from his book review of The Work of Nature: How the Diversity of Life Sustains Us by Yvonne Baskin, 1997. Newsletter of Earth Day Southern Tier, February/March 1999, p. 2** "Human tampering with nature has not been without costs. Human manipulation of existing ecosystems has also sometimes had unfortunate consequences." http://www.mikehudak.com/Articles/FromPrairieDogs9902.html **Review: Not Relevant to the Project** *The article referenced is a book review, not a scientific study with peer review. Hudak states the book is written for the general audience and that it clearly explains environmental concepts and components, such biodiversity, ecosystem services and keystone species. He concludes that the reader can use the facts in the book to protect endangered species and other environmental components. The excerpt provided here is a cut/paste of two individual statements in the review.*
4	**Huff, Mark H. Ph.D.; Ottmar, Roger D.; Alvarado, Ernesto Ph.D. Vihnanek, Robert E.; Lehmkuhl, John F.; Hessburg, Paul F. Ph.D. Everett, Richard L. Ph.D. 1995. "Historical and current forest landscapes in eastern Oregon and Washington. Part II: Linking vegetation characteristics to potential fire behavior and related smoke production" Gen. Tech. Rep. PNW-GTR-355. USDA Forest Service, Pacific Northwest Research Station.** "In general, rate of spread and flame length were positively correlated with the proportion of area logged (hereafter, area logged) for the sample watersheds. Correlation coefficients of area logged with rate of spread were > 0.57 for five of the six river basins (table 5). Rate of spread for the Pend Oreille and Wenatchee River basins was strongly associated (r-0.89) with area logged. Correlation of areas logged with flame length were > 0.42 for four of six river basins (table 5). The Deschutes and Methow River basins showed the strongest relations. All harvest techniques were associated with increasing rate of spread and flame length, but strength of the associations differed greatly among river basins and harvesting methods." (pg.9) "As a by-product of clearcutting, thinning, and other tree-removal activities, activity fuels create both short- and long-term fire hazards to ecosystems. The potential rate of spread and intensity of fires associated with recently cut logging residues is high, especially the first year or two as the material decays. High fire-behavior hazards associated with the residues can extend, however, for many years depending on the tree. Even though these hazards diminish, their influence on fire behavior can linger for up to 30 years in the dry forest ecosystems of eastern Washington and Oregon." https://ir.library.oregonstate.edu/dspace/bitstream/1957/4706/1/PB96155213.pdf **Review: Not Relevant to the Project** *The paper referenced (Huff et al. 1995) above was an attempt to compare the potential fire behavior and smoke production of historical and current time periods for forty-nine 5,100 to 13,500 hectare watersheds. It was a landscape-level modeling exercise based upon vegetation type and timber*

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	harvest type classification from aerial photo interpretation of historic (1938-1959) and current (1985-1992) aerial photos. The authors used fuel behavior photo series to assign fuel loading by vegetation type for non-harvested areas and by harvest-type in harvested areas. Due to lack of site-specific information, they assigned a fire behavior photo series that matched older logging slash to the harvests, assuming in the process that no post-treatment fuels reduction treatments had ever taken place. They also only modeled surface and moderate- to low-intensity understory fires and constant weather and topographic conditions. *Although it produces interesting results, Huff et al. (1995) has little relevance to the Flint Foothills Project. The treatments proposed in the Flint Foothills Project include commercial and non-commercial thinning-from-below treatments, followed jackpot or pile burning. The fuels and fire behavior conditions created by the project will differ greatly than that modeled by Huff et al. (1995).* *The Flint Foothills Project purpose and need does not include harvest activities for fuel treatment or reduction. Slash created through harvest activities would be mitigated through whole tree yarding at central landing sites.*
4	**Hutto, Richard L. Ph.D. "The Ecology of Severely Burned Forests" *Counterpunch*, July 19 / 20, 2008.** "As summer wildfire season begins in earnest throughout much of the West, it's important for the public and policymakers to recognize the important role that severely burned forests play in maintaining wildlife populations and healthy forests. Severely burned forests are neither "destroyed" nor "lifeless." From my perspective as an ecologist, I have become aware of one of nature's best-kept secrets – there are some plant and animal species that one is hard-pressed to see anywhere outside a severely burned forest." "An appreciation of the biological uniqueness of severely burned forests is important because if we value and want to maintain the full variety of organisms with which we share this Earth, we must begin to recognize the healthy nature of severely burned forests. We must also begin to recognize that those are the very forests targeted for postfire logging activity. Unfortunately, postfire logging removes the very element – dense stands of dead trees – upon which many fire-dependent species depend for nest sites and food resources." http://www.counterpunch.org/hutto07192008.html **Review: Not Relevant to the Project** *This document is a commentary on the ecological aspects and benefits of severely burned forests. The Flint Foothills Project does not contain or propose to treat areas of severely burned forest.*
4	**Ingalsbee, Timothy Ph.D. "Logging for Firefighting: A Critical Analysis of the Quincy Library Group Fire Protection Plan." Unpublished research paper. 1997.** "The Quincy Library Group's (QLG's) fuelbreak strategy represents a giant step backwards from the progressive development of rational fire policies established by the 1995 Federal Wildland Fire Management Policy and Program Review." "The fact that the QLG admits that its Plan is inconsistent with these new policies (indeed, is almost gleefully defiant of them) says a lot about the credibility of the QLG's self-purported fire management expertise." "In spite of (or more likely because of) the intensive 'fuels reduction' activities associated with commercial logging, the Fountain Fire was truly catastrophic in its effects."

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	"Even 'kinder, gentler' commercial logging still inflicts environmental impacts such as eroded topsoil, degraded water quality, destroyed wildlife habitat, and extirpated species that are every bit as much symptoms of forest health problems as large-scale, severe wildfires." "And after spending millions of dollars creating the SNEP Report, it seems wise to use its information, not ignore it or opportunistically select out statements clearly worded as assumptions, values, or goals which run contrary to factual research findings. The QLG Plan has much more to do with timber extraction than with genuine fire protection, and in that respect, it constitutes more of a forest health threat than a real solution." "The QLG Bill resembles similar 'panic legislation' that was passed during the early 1970s in which, following some large-scale wildfires in California, Congress allowed the Forest Service to access emergency firefighting funds to conduct 'presuppression' timber sales. Many fuelbreaks were cut in the Sierras during this period, and while costs rapidly rose into tens of millions of dollars, most of these fuelbreaks failed to perform adequately during wildfire suppression incidents. Congress quickly had to take away this funding source from the Forest Service. What has become of these old fuelbreaks? Almost without exception, the agency failed to monitor or maintain them, and in a modern-day version of 'cut and run' logging, many of these old fuelbreaks have converted to chaparral brush and 'dog-hair' thickets ¼ a much more flammable vegetation type than the original forest cover. The QLG Bill appears to be 'deja vu' without evidence of Congress or the QLG being aware of this history of previous fuelbreak programs." http://www.fire-ecology.org/research/logging-for-firefighting_2.htm **Review: Not Relevant to the Project** *The citation is from an analysis of the Quincy Library Group Bill (H.R.858); the article references the effects of logging, thinning, and fuel reduction treatments on wildfire risk on QLG timber sale sites in California. The Flint Foothills Management Project in Montana is not subject to the QLG Plan. While the Flint Foothills project does propose thinning and clearcut salvage harvest, it is not a fuels reduction project and the purpose and need does not include construction of fuelbreaks or reduction in the risk of wildfire.*
4	**Ingalsbee, Timothy Ph.D. 2000. "Commercial Logging for Wildfire Prevention: Facts Vs. Fantasies"** "The notion that commercial logging can prevent wildfires has its believers and loud proponents, but this belief does not match up with the scientific evidence or history of federal management practices. In fact, it is widely recognized that past commercial logging, road-building, livestock grazing and aggressive firefighting are the sources for "forest health" problems such as increased insect infestations, disease outbreaks, and severe wildfires." "How can the sources of these problems also be their solution? This internal contradiction needs more than propaganda to be resolved. It is time for the timber industry and their supporters to heed the facts, not fantasies, and develop forest management policies based on science, not politics." http://www.fire-ecology.org/citizen/logging_and_wildfires.htm **Review: Not Relevant to the Project** *The definition of prevent is: To stop or to keep from happening. The first statement is incorrect in that the Forest Service does not maintain that commercial logging can prevent wildfires. To prevent wildfires, one would have to stop all human and natural (i.e. lightning) ignition sources.*

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	Vegetation treatments are done to modify fire intensity and severity. The rest of the comment is largely opinion, based upon the faulty premise of the first sentence. The Flint Foothills project doesn't propose to use commercial logging for wildfire prevention.
4	**Ingalsbee, Timothy Ph.D. "Logging without Limits isn't a Solution to Wildfires" published in the Portland Oregonian, August 6, 2002** "Since the 'New Perspectives' program of the early 1990s, the agency has tried to dodge public opposition to commercial logging by using various euphemisms, such as this gem from the Siskiyou National Forest: Clearcuts are called 'minimum green tree retention units.' Accordingly, Forest Service managers have believed that if they simply refer to logging as 'thinning,' or add the phrases 'fuels reduction' or 'forest restoration' to the title of their timber sale plans, then the public will accept these projects at face value, and business-as-usual commercial logging can proceed. In the face of multiple scandals and widespread public skepticism of the Forest Service's credibility, it seems that only Congress is buying the agency's labeling scheme." http://www.klamathforestalliance.org/Documents/loggingwithoutlimits.html **Review: Not Relevant to the Project** *This excerpt is from an opinion article in a newspaper where the author describes those activities he does and does not view as appropriate for fuels reduction. The Flint Foothills Project is not a fuels reduction project. For commercial-sized timber, there is a need to salvage dead and dying lodgepole pine trees to create managed stand conditions and capture the value of the wood product before it deteriorates; and a need to reduce forest densities to maintain or improve resilient forest conditions. The salvage is proposed to be accomplished through a regeneration clearcut harvest; the density reductions through commercial thinning, precommercial thinning and prescribed underburning.*
4	**Ingalsbee, Timothy Ph.D. "The wildland fires of 2002 illuminate fundamental questions about our relationship to fire." The Oregon Quarterly, Winter 2002.** "Thus, the use of commercial logging for fire hazard reduction poses yet another paradox: Logging removes the trees that normally survive fires, leaves behind the trees that are most often killed by fire, increases flammable fuel loads, and worsens fire weather conditions." (pg. 5) http://fireecology.org/research/wildfire_paradox.pdf **Review: Not Relevant to the Project** *This excerpt is from an opinion article published in a newpaper where the author states that society needs to "resolve some of the cultural and institutional paradoxes that characterize our relationship with forest fires" including the use of commercial logging for fire hazard reduction. With respect to thinning he believes that it can be used as a means of preparing forests for prescribed and wildlife fires. The purpose and need for the Flint Foothills Project does not include the use of commercial logging to reduce hazardous fuels.*
4	**Ingalsbee, Timothy Ph.D. "Fanning the Flames! The U.S. Forest Service: A Fire-Dependent Bureaucracy." *Missoula Independent*. Vol. 14 No. 24, June 2003.** "In the face of growing public scrutiny and criticism of the agency's logging policies and practices, the Forest Service and their enablers in Congress

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	have learned to mask timber sales as so-called 'fuels reduction' and 'forest restoration' projects. Yet, the net effect of these logging projects is to actually increase fire risks and fuel hazards." "Decades of encouraging private logging companies to take the biggest, oldest, most fire-resistant trees from public lands, while leaving behind a volatile fuel load of small trees, brush, weeds, stumps and slash has vastly increased the flammability of forestlands." "In addition to post-fire salvage logging, the Forest Service and timber industry advocates in Congress have been pushing pre-fire timber sales, often falsely billed as hazardous fuels reduction or 'thinning' projects, to lower the risk or hazard of future wildfires. In too many cases, these so-called thinning projects are logging thick-diameter fire-resistant overstory trees instead of or in addition to cutting thin-sized fire-susceptible understory trees. The resulting logging slash and the increased solar and wind exposure can paradoxically increase the fuel hazards and fire risks." http://www.fire-ecology.org/research/USFS_fire_dependent.html **Review: Not Relevant to the Project** *This is an opinion piece published in a newspaper in which the author discusses his disagreement with Forest Service forest and fire management policies. It contains no sources, references, or literature cited and is not a peer reviewed research paper. This project does not propose commercial logging to prevent wildfires.*
4	**Ingalsbee, Timothy Ph.D. 2005. "A Reporter's Guide to Wildland Fire." Published by the Firefighters United for Safety, Ethics, and Ecology (FUSE), January 2005.** "More than any other recent human activity, the legacy of commercial timber extraction has made public forests more flammable and less resilient to fire. Firstly, clearcut and high-grade logging have historically taken the largest, most fire-resilient, most commercially-valuable trees, and left behind dead needles and limbs (logging debris called "slash"), along with smaller trees and brush that are less commercially valuable but more flammable than mature and old-growth trees. The net effect is to increase the amount of available hazardous fuel." "Secondly, the removal of large overstory trees also changes the microclimate of logged sites, making them hotter, drier, and windier, which increases the intensity and rate of spread of wildfires. Third, the creation of densely-stocked even-aged plantations of young conifers made sites even more flammable since this produced a solid mass of highly combustible conifer needles within easy reach of surface flames. These changes in the fuel load, fuel profile, and microclimate make logged sites more prone to high-intensity and high-severity wildfires." http://www.fusee.org/docs/RptrsGuide_Chapters/RptrsGuide2007_web.pdf **Review: Not Relevant to the Project** *This is an opinion piece not a peer reviewed research paper. This project does not propose commercial logging to prevent wildfires. Slash created through harvest activities would be mitigated through whole tree yarding at central landing sites for disposal.*
4	**Ivins, Molly. Creators Syndicate, August 3 1997 08 03** "Last winter was unusually wet in the Pacific Northwest. The result was landslides all over caused by logging roads; five people died, spawning

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	streams were ruined, water supplies were contaminated and the flooding was tremendously aggravated. According to David Bayles, conservation director of the Pacific Rivers Council, aerial surveys documented more than 650 landslides in February in Washington and Oregon alone. The stupidest and most dangerous practice is allowing logging roads on steep slopes — that's really asking for it. You may ask yourself why the taxpayers are expected to pony up to build roads for profitable logging companies. Build roads for the timber companies in order to stimulate the U.S. logging, paper and building industries. There's just one problem. A lot of U.S. logs get shipped overseas, mostly to Japan. We're actually subsidizing Japanese companies while doing terrible damage to our environment and not helping the U.S. job scene much except when it comes to cutting Start with the assumption that the U.S. Forest Service a component of the Department of Agriculture, is simply an auxiliary branch of the timber industry and you'll pretty much have the picture of what's going on. Last winter, the Forest Service refused a bid at a timber auction from an environmentalist who wanted to save, not harvest, a stand of evergreens in the Okanogan National Forest in Washington. Instead, the Forest Service accepted a bid of $15,000 from a logging company that cut 3.5 million board-feet of lumber in that stand. Try to find a price like that at Home Depot." http://www.creators.com/opinion/molly-ivins/molly-ivins-august-3-1997-08-03.html **Review: Not Relevant to the Project** *These excerpts are from an opinion piece, none of which cite or are relevant to the Flint Foothills Vegetation Management Project. The Flint Foothills project is on NFS lands in Montana. Timber harvested from this area could not be exported to Japan: a provision of the Department of the Interior and Related Agencies Appropriation Act, 1974 (P.L. 93-120, October 4, 1973) prohibited the export of unprocessed timber harvested from Federal lands in the west. One section of System road construction is proposed in the Flint Foothills project to ensure the road is built to specification suitable for the steep terrain in the area.*
4	**Jalkotzy, M.G., P.I. Ross, and M.D. Nasserden. 1997. "The Effects of Linear Developments on Wildlife: A Review of Selected Scientific Literature." Prepared for Canadian Association of Petroleum Producers. Arc Wildlife Services Ltd., Calgary. 115pp.** "Linear developments may result in habitat avoidance for grizzly bears. Logging-truck traffic in the Kimsquit Valley in British Columbia resulted in a 78% reduction in use of the "Zone of Hauling Activity" by radio collared bears compared to non-hauling periods (16). For 14 hours/day, 3%-23% of each bear's home range was unavailable to them because of disturbance." "The impacts of land-use activities on wolverines are likely similar to those on grizzly bears. Wolverines seem to have been most affected by activities that fragment and supplant habitat, such as human settlement, extensive logging, oil and gas development, mining, recreational developments, and the accompanying access. Wolverine populations that are now at the edge of extirpation have been relegated to the last available habitat that has not been developed, extensively modified, or accessed by humans." http://citeseerx.ist.psu.edu **Review: Relevant to the Project**

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	This is a bibliography of papers, over 200 pages and it does not include an abstract of the papers. *The quoted portion above deals with grizzly bears, which are addressed in the wildlife section of the DEIS. It goes on to say that effects are likely similar for wolverines. Analysis for the Forest Plan recognized the potential effects of roads and human access on wildlife (including wolverine). As a result, the Forest Plan includes a secure area goal (measured by open motorized road and trail density), objectives to reduce open motorized road and trail density (OMRTD) in specific landscapes and hunting units, and standards to have no net increase in OMRTD in those areas where OMRTD objectives are exceeded.* *Analysis of the effects of this project on wildlife secure habitats and OMRTDs is found in the wildlife section of the DEIS (especially grizzly bear, wolverine, and elk sections).*
4	**Jones, Julia A. Ph.D., Frederick J. Swanson Ph.D. Beverley C. Wemple Ph.D., and Kai U. Snyder. "Effects of roads on hydrology, geomorphology, and disturbance patches in stream networks." Conservation Biology 14, No. 1. 2000.** "Although disturbance patches are created by peak flow and debris flow disturbances in mountain landscapes without roads, roads can alter the landscape distributions of the starting and stopping points of debris flows, and they can alter the balance between the intensity of flood peaks and the stream network's resistance to change." http://www.jstor.org/stable/2641906 **Review: Relevant to the Project** *This peer-reviewed journal article looks at some of the effects of roads on debris flows and flood peaks in the H.J. Andrews Experimental Forest in the Cascade Mountains, Oregon. No debris flows were observed in the project area, and the climate and geology are significantly different from the study area in the article. Because of this difference, this article is only somewhat relevant to the project. The article has utility in that patch dynamics and recovery rates can be influenced by road-stream interactions, and better understanding these relationships can lead to better understanding of the effects of high-risk roads on streams and riparian systems. These conclusions are applicable to this project because it may be a useful way to further understand channel disturbance and recovery processes in the project area. These topics are not directly addressed in the DEIS, but the potential effects of roads and timber harvest on channels is disclosed in the Hydrology specialists report.*
1	**Juel, J. 2003. "Old Growth at a Crossroads: U.S. Forest Service Northern Region National Forests' noncompliance with diversity provisions of their Forest Plans and the National Forest Management Act Regulations." August, 2003. The Ecology Center, Inc. Missoula, Montana.** "Unfortunately, region-wide the FS has failed to meet Forest Plan old-growth standards, does not keep accurate old-growth inventories, and has not monitored population trends in response to management activities as required by Forest Plans and NFMA (Juel, 2003)." http://www.landsinfo.org/ecosystem_defense/Science_Documents/Juel_2003.pdf **Review: Not Relevant to the Project** *The report referenced above is not a scientific study with peer review, rather is a report to investigate how Forest Plans within Region 1 of the*

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	Forest Service were complied with in regards to old growth monitoring. The Beaverhead-Deerlodge NF Forest Plan is new since 2009, so the reference speaks to the old Forest Plans for the two original Forests, which are no longer providing direction.
4	**Kahklen, Keith. "A Method for Measuring Sediment Production from Forest Roads." Pacific Northwest Research Station, USDA Forest Service. Research note PNW-RN-529, April 2001.** "In the Pacific Northwest, the two main processes that contribute to sediment production are mass failure and surface erosion from forest roads (Fredriksen 1970, Reid and Dunne 1984). In the Clearwater River basin in the State of Washington, as much as 40 percent of the sediment produced in the watershed was attributed to logging roads (Reid 1980)." http://www.fs.fed.us/pnw/pubs/rn529.pdf **Review: Relevant to the Project** *This peer-reviewed government report is relevant to the project. Predicting sediment production from forest roads is necessary to determine their impact on watersheds and associated terrestrial and stream biota. This article provides a technique for evaluating sediment production from forest roads. Road WEPP was used in this project to evaluate sediment production from project haul roads and is discussed in the DEIS.*
4	**Karr, James R. Ph.D., Christopher A. Frissell Ph.D., Jonathan J. Rhodes, David L. Perry Ph.D. and G. Wayne Minshall Ph.D. Excerpt from a letter to the Subcommittee on Forests & Forest Health U.S. House of Representatives. 3 July, 2002.** "It is indisputable that roads are one of the greatest threats to the ecological integrity of forested systems and associated river, wetland, lake, and coastal ecosystems. Yet, the USFS has failed to adopt a policy that mandates reversing the worst ecological effects of roads, or that precludes incursion of roads into roadless areas. Despite widespread recognition of these facts, the USFS diverts staff and money to extraordinarily costly salvage logging projects at the expense of reducing the extent of the road network or undertaking needed fine-fuels reductions in unburned forests." http://www.nativeforest.org/campaigns/wildfire_info_center/letter_from_beschta.htm **Review: Not Relevant to the Project** *This article states the allegations that the Forest Service may have adopted a policy that does not reverse the ecological effects of roads. This article is not peer-reviewed and is a summary of the Beschta Report presented to Congress. Further, it states generalizations regarding roads and road management by the Forest Service that may or may not be applicable to this project. It does not contain data or analysis however, so observations made in this report may more broadly apply to roads management and other ecological effects.*
4	**Karr, James R. Ph.D., "Nature doesn't Benefit from Logging Fire-Damaged Lands". Op-Ed Tacoma News Tribune. December 8, 2005.** "Trees in a burned landscape, both dead and alive, continue to provide homes for wildlife after a fire and form the building blocks of new forests." www.landsinfo.org/ecosystem_defense/Science_Documents/Karr_2005.doc **Review: Not Relevant to the Project**

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	This article consists of an Op-Ed opinion addressing post-fire salvage logging. The Flint Foothills Project does not contain or propose to treat post-fire areas.
1	**Katzner, T., and K. Parker. 1997. Vegetative characteristics and size of home ranges used by pygmy rabbits (Brachylagus idahoensis) during winter. J. Mammology 78:1063-1072.** As related to letter 1, comment 35; additional literature to address **Review: Not Relevant to the Project** *This paper determined sizes of home ranges for pygmy rabbits in southwestern Wyoming and characterized the vegetation within and outside those areas used during winters of 1993 and 1994.The project area is located well north of the known distribution of pygmy rabbits. In addition, proposed activities are located outside potential pygmy rabbit habitats.*
4	**Kaufmann, Merrill R. "Good Fire, Bad Fire" Rocky Mountain Research Station. Fort Collins, CO, USDA Forest Service** "Carefully done science can provide common ground for agreement among different stakeholders, enabling communities to unify." "The best science available tells us that at some point we must reinstall this missing ecosystem process so the natural machinery functions properly again." (pg. 9) http://csfs.colostate.edu/pdfs/Good_Fire_Bad_Fire.pdf **Review: Not Relevant to the Project** *This excerpt is from a multi-agency and NGO brochure that is not peer-reviewed scientific literature. The emphasis of the brochure is "how to think about forest land management and ecological processes" with the summarizing 'Our Task' section stating that "thinning on a large scale will require commitment and innovation" which is not specific to the Flint Foothills Project.*
4	**Keene, Roy "Logging does not prevent wildfires" Guest Viewpoint, the *Eugene Register Guard* January 11, 2009** "History, not science, refutes the claim that logging helps to prevent forest fires. The forests of the West are far more vulnerable to fire due to a century of industrial logging and fire suppression. Logging has removed most of the older, fire-resistant trees from the forests. Fire suppression has encouraged many smaller and more flammable trees, brush and dense plantations to fill the holes. Logging has set the forests of the West up to burn big and hot. More logging will not fix this." http://www.highbeam.com/doc/1G1-192070397.html **Review: Not Relevant to the Project**

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	This is an opinion piece not a peer reviewed research paper. Flint Foothills does not propose using logging to prevent forest fires.
1	**Keane, R. E. Arno, S. F. 1993. Rapid decline of whitebark pine in western Montana: Evidence from 20-year remeasurements. W. Jour. Of Applied Forestry 8(2):44-47.** "White pine blister rust, an introduced disease, has caused rapid mortality of whitebark pine over the last 30 to 60 years. Keane and Arno (1993) reported that 42 percent of whitebark pine in western Montana had died in the previous 20 years with 89 percent of remaining trees being infected with blister rust." www.wilderness.net/library/documents **Review: Relevant to the Project** *This paper documents a summary of findings on rate of whitebark pine decline, based on remeasured inventory plots in 1991 and 1992 that were initially established in 1971. The quote provided above concerning the effects of white pine blister rust to whitebark pine is relevant to the project and discussed in the Vegetation analysis.*
1	**Keane R.E., Veblen T, Ryan KC, Logan J, Allen C, Hawkes B. 2002. *The cascading effects of fire exclusion in the Rocky Mountains*. In 'Rocky Mountain Futures: an Ecological Perspective'. (Ed. JS Baron) pp. 133– 153. (Island Press: Washington, DC)** "Not all ecosystems or all Rocky Mountain landscapes have experienced the impacts of fire exclusion. In some wilderness areas, where in recent decades natural fires have been allowed to burn, there have not been major shifts in vegetation composition and structure (Keane et al. 2002). In some alpine ecosystems, fire was never an important ecological factor. In some upper subalpine ecosystems, fires were important, but their rate of occurrence was too low to have been significantly altered by the relatively short period of fire suppression (Keane et al. 2002)." http://scholar.google.com/scholar?q=Keane+et+al.+2002+fire&hl=en&as_sdt=0&as_vis=1&oi=scholart **Review: Relevant to the Project** *The link is to a limited, pages omitted section of a larger book. The relevance of natural fires and their effects on ecosystems, along with the impacts of fire exclusion (depending on Fire Groups, wherein at some elevations fire disturbances are within natural frequencies) has been discussed in the project analysis.*
4	**Keppeler, Elizabeth T. Robert R. Ziemer Ph.D., and Peter H. Cafferata. "Effects of Human-Induced Changes on Hydrologic Systems." An American Water Resources Association publication, June 1994.** "Timber harvesting operations affect hydrologic processes by reducing canopy interception and evapotranspiration. Many studies have documented changes in soil properties following tractor yarding (Stone, 1977; Cafferata, l983), and low-ground-pressure skidding (Sidle and Drlica, 1981). More recently, researchers have evaluated cable yarding (Miller and Sirois, 1986; Purser and Cundy, 1992). In general, these studies report decreased hydraulic conductivity and increased bulk density in forest soils after harvest." http://www.fs.fed.us/psw/publications/ziemer/Ziemer94a.PDF

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	Review: Relevant to the Project *This peer-reviewed article is about hillslope hydrological processes in Northern California resulting after timber harvest. The effects observed in this article regarding changes in hillslope hydrology that may occur with this project. Local changes in hillslope hydrology are not specifically addressed in the hydrology report for this project, as the effects are not expected to be measurable. However, the cumulative harvest percentages were calculated and an effort was made to evaluate changes in water yield that might be expected after harvest. See the hydrology report.*
4	**Klein, Al. 2004. "Logging Effects on Amphibian Larvae Populations in Ottawa National Forest"** "Among these four species of amphibians, the spotted salamander is most likely to be affected adversely by the logging as this species of salamander relies on dense forests with full canopies (Harding, 1997)." "Looking at the study on a larger scale, the potential for changes caused by logging is great. Absence of trees could influence water temperature by altering available sunlight, conductivity by changing the amount of organic matter that collects in the vernal ponds, or pH if the logging process deposits foreign residues to the area. Also heavy equipment used to harvest the timber has the potential to alter the terrain." "Modifications to the landscape could change how water flows and collects at the surface and change the size, shape, and location of the vernal ponds. Loss or alteration to small temporary water sources less than four hectares can be extremely detrimental to amphibians water (Semlitsch, 2000). Without vernal ponds amphibians would have difficulty inhabiting forested areas because they rely on the ponds as breeding grounds. If logging disturbs the ponds, amphibian populations could diminish in the areas that surround these vernal pools." http://www.nd.edu/~underc/east/education/documents/AKlein2004Pre-loggingsurveyofamphibianlarvaeinvernalpools.pdf **Review: Not Relevant to the Project** *This study compare species richness and density of amphibians in vernal ponds on the Ottawa National Forest in Michigan, before and after logging, to determine if harvesting affects amphibian populations. This paper does not provide site specific or species specific information relevant to the Flint Foothills project area in Montana. Analysis of effects to amphibian populations and habitat are discussed in the EIS.*
4	**Kulakowski, Dominik Ph.D. Assistant Professor, Clark University. Testimony before the Subcommittee on Public Lands and Forests of the Energy and Natural Resources Committee of the United States Senate April 21, 2010** "Although ongoing outbreaks understandably have led to widespread public concern about increased fire risk, the best available science indicates that outbreaks of mountain pine beetle and spruce beetle do not lead to an increased risk of fire in the vast majority of forests that are currently being affected. We should not let the effects of bark beetle outbreaks, as spectacular as they may be, distract us from the real risk. The real concern in that we have built homes, communities, ski resorts, and other infrastructure in inherently flammable ecosystems. The ongoing outbreaks have not increased the risk of wildfire as much as they have drawn attention to the risk that has been there long before the outbreaks began. Forests of lodgepole pine and spruce-fir are prone to high-severity fires during drought conditions, regardless of the influence of bark beetle outbreaks." (Pg. 5) http://energy.senate.gov/public/_files/KulakowskitestimonyonS2798042110.pdf

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	Review: Not Relevant to the Project The presenter's "goal" of his testimony is to "summarize the best available science on the relationship between beetle outbreaks and fire risk and on associated mitigation efforts." He addresses beetle outbreaks; climate; strategies for reducing fire risk to homes/ 206igantean206s and public safety; and preventing outbreaks. He concludes that outbreaks of mountain pine beetle and spruce beetle do not lead to increased risk of fire in the majority of forests currently affected and that the real concern is the proximity of communities and development in flammable ecosystems. . ; and the risk of fire. The Flint Foothills Project is not a fire hazard mitigation proposal, there are no homes to protect or communities at risk; there is no WUI within the project area.
1	**Lacy, Peter M. 2001. *Our Sedimentation Boxes Runneth Over: Public Lands Soil Law As The Missing Link In Holistic Natural Resource Protection.* Copyright © 2001 Environmental Law; Peter M. Lacy. Originally published at 31 Envtl. L. 433 (2001).** Lacy, 2001 examines the importance of soils for ecosystem functioning and points out the failure of most regulatory mechanisms to adequately address the soils issue. From the Abstract: http://maps.wildrockies.org/ecosystem_defense/Science_Documents/Lacy_2001.pdf **Review: Relevant to the Project** *The discussion by Lacy in which he "examines the gap with respect to soil conservation and protection in current federal public land and resources law," is relevant to the Flint Foothills project. While Lacy provides a discussion on the history of public lands soil law and associated flaws, he does state, "Of all public natural resource laws, the National Forest Management Act (NFMA) provides by far the greatest protection to the soil resource." Lacy also acknowledges that the Forest Service has developed "somewhat extensive internal standards in its Forest Service Manual (FSM) and Forest Service Handbook (FSH)."* *National Forest Management Act (NFMA) of 1976 requires that the Forest Service (FS) manage National Forest System lands without substantial and permanent impairment of land productivity and to maintain or improve soil quality. To assure compliance with the NFMA requirement, the FS established Regional Soil Quality Standards. In Region 1 the SQS were most recently revised in 1999.* *Soil productivity is defined in FSM 2500, Chapter 2550-Soil Management (Forest Service Manual, National Headquarters (WO), Washington DC, 2010) as "the inherent capacity of the soil resource to support appropriate site-specific biological resource management objectives, which includes the growth of specified plants, plant communities, or a sequence of plant communities to support multiple land uses." Because soil productivity is not easily measured (Powers and others 1998; Powers 2002), direct measurement of soil productivity is rarely used, even in research. Rather, surrogates of soil productivity are measured. The Northern Region uses soil disturbance as the surrogate for potential effects to soil productivity and has established thresholds for allowable disturbance. According to Powers (1998) the goal is to define the functional elements of soil that sustain productivity and to identify soil quality indicators of these functions. He further describes the attributes of useful indicators. The indicators that the Northern Region has selected are intended to provide an assessment of potential management effects on the soil functions, which work in combination to produce biomass (productivity). Soil productivity is not a stand-alone soil function. Several soil functions contribute to soil*

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	productivity. Although one or more soil functions may be affected by previous or proposed activities, soil productivity may or may not be maintained.
4	**Laverty, Lyle, USDA Forest Service and Tim Hartzell, U.S. Department of the Interior. "A Report to the President in Response to the Wildfires of 2000", September 8, 2000.** "The Congressional Research Service (CRS) recently addressed the effect of logging on wildfires in an August 2000 report and found that the current wave of forest fires is not related to a decline in timber harvest on Federal lands. From a quantitative perspective, the CRS study indicates a very weak relationship between acres logged and the extent and severity of forest fires. To the contrary, in the most recent period (1980 through 1999) the data indicate that fewer acres burned in areas where logging activity was limited." "Qualitative analysis by CRS supports the same conclusion. The CRS stated: "[T]imber harvesting removes the relatively large diameter wood that can be converted into wood products, but leaves behind the small material, especially twigs and needles. The concentration of these fine fuels on the forest floor increases the rate of spread of wildfires." Similarly, the National Research Council found that logging and clearcutting can cause rapid regeneration of shrubs and trees that can create highly flammable fuel conditions within a few years of cutting." http://www.fs.fed.us/emc/hfi/president.pdf **Review: Not Relevant to the Project** *This is a report that summarizes a Congressional Research Service study of the effects of logging on wildfire risk. The report recommends how best to respond to the year 2000 wildfires fires, reduce the impacts of these wildland fires on rural communities, and ensure sufficient firefighting resources in the future. It contains no sources, references, or literature cited and is not scientific, peer-reviewed literature. The report goes on to further clarify that without adequate treatment of small woody material, logging may exacerbate fire risk rather than lowering it. The purpose and need for the Flint Foothills Project does not include an objective for hazardous fuels reduction. Slash created through the proposed harvest activities would be whole tree yarded at central landing sites for disposal. The concern over the removal of large merchantable trees bears little relevance to the Flint Foothills project because the proposed thinning is from below and would concentrate on removing dead trees.*
4	**Lawren, Bill 1992 "Singing the Blues for Songbirds: Bird lovers lament as experts ponder the decline of dozens of forest species" National Wildlife** "Forest fragmentation, as scientists call the intentional felling of woodland, is actually two processes. In populated areas such as the Atlantic seaboard, it means reduction in the size of forest tracts, usually due to suburbanization and development. In less inhabited areas–northern New England, for example–forest fragmentation refers to isolation of one patch of forest from another by logging, or by the building of roads or power lines." http://www.nwf.org/News-and-Magazines/National-Wildlife/Birds/Archives/1992/Singing-the-Blues-for-Songbirds.aspx **Review: Not Relevant to the Project** *This article discusses fragmentation and birds on the east coast. Forest types, historic and current vegetation trends, development and bird species all vary dramatically from the Flint Foothills project area.*

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4	**Lawrence, Nathaniel, NRDC senior attorney "Gridlock on the National Forests" Testimony before the U.S. House of Representatives Subcommittee on Forests and Forest Health (Committee on Resources) December 4, 2001.** "I will turn first to forest thinning aimed at reducing fire risks. There is surprisingly little scientific information about how thinning actually affects overall fire risk in national forests." "How can it be that thinning could increase fire risks? First, thinning lets in sunlight and wind, both of which dry out the forest interior and increase flammability. Second, the most flammable material – brush, limbs, twigs, needles, and saplings – is difficult to remove and often left behind. Third, opening up forests promotes brushy, flammable undergrowth. Fourth, logging equipment compacts soil so that water runs off instead of filtering in to keep soils moist and trees healthy. Fifth, thinning introduces diseases and pests, wounds the trees left behind, and generally disrupts natural processes, including some that regulate forest health, all the more so if road construction is involved." http://www.nrdc.org/land/forests/tnl1201.asp **Review: Not Relevant to the Project** *The testimony is over the proposed Healthy Forests Initiative in which hazardous fuel reductions activities could be categorically excluded from documentation in an EA or EIS in order to ensure more timely decisions. The presenter does not believe that thinning is a proven silvicultural practice for fuels reduction, and hence, project proposing to use thinning to reduce should not be allowed to be categoricaly excluded from documentation. The purpose and need for the Flint Foothills Project does not include an objective to reduce hazardous fuels; and the analysis is being documented in an EIS. A number of studies and reports have been made over the years investigating the effect of thinning on fire behavior and effects. A list of empirical studies, case studies, and discussion papers is available in the project file that support the use of tree thinning to modify fire behavior and effects.*
4	**Leitner, Brian. "Logging Companies are Responsible for the California Wildfires." The Democratic Underground, October 30, 2003.** "Those who would argue that this form of logging has any positive effects on an ecosystem are clearly misinformed. This type of logging has side effects related to wildfires, first and foremost being that the lumber companies aren't interested in hauling out all the smaller trees, branches, leaves, pine needles, sawdust, and other debris generated by cutting all these trees. All this debris is left on site, quickly dries out, and is far more flammable sitting dead on the ground than it was living in the trees. Smaller, non-commercially viable trees are left behind (dead) as well – creating even more highly flammable fuel on the ground. http://www.democraticunderground.com/articles/03/10/30_logging.html **Review: Not Relevant to the Project** *The "form of logging" that the author is referring to is both clearcutting and thinning. He defines thinning as "essentially, taking the largest, healthiest, and most fire-resistant trees they can find and leaving the smaller, more flammable trees behind" (Leitner 2003). The quotation is opinion and irrelevant to the Flint Foothills project because it addresses activities that we are not proposing to do. At the top of the article, there are two pictures side-by-side with the title of the article superimposed over the pictures. The picture on the left is of a large, recently-cut, clearcut from which*

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	the logs have not even been removed yet from an unknown location The picture on the right is the popular picture taken in 2000 on the Bitterroot NF outside of Sula, Montana, showing two Elk standing in the middle of the river while the partially timbered hillside burns intensely in the background. The Flint Foothills project proposes to salvage by cleracut dead and dying 209igantean pine and thin Douglas-fir and ponderosa pine from below. This is an opinion piece not a peer reviewed research paper.
4	**Logan, Jesse A. Ph.D. and James A. Powell Ph.D. "Ghost Forests, Global Warming and the Mountain Pine Beetle (*Coleoptera*: *Scolytidae*)" AMERICAN ENTOMOLOGIST • Fall 2001 http://www.usu.edu/beetle/documents/Logan_Powell01.pdf** "The mountain pine beetle is a native insect, having co-evolved as an important ecological component of western pine forests. The inter-relationship between beetle-caused mortality and subsequent fire has resulted in a basic ecological cycle for many western forests (Schmidt 1988). Some pines species, such as lodgepole pine, are maintained by periodic disturbances. The lodgepole pine forest-type1 typically is an essential monoculture of even-aged trees that were initiated by a catastrophic, stand-replacing fire. Without the influence of fire (Fig. 1B), lodgepole pine would be lost over much of its native range (Brown 1975, Lotan et al. 1985). Fire serves to prepare the seedbed, releases seeds from the serotinous cones (triggered to release seeds by heat of a fire), and eliminates more shade-tolerant species such as spruce or fir that would eventually out-compete and replace the early seral lodgepole pine." **Review: Relevant to the Project** *The above quote from the article does apply to the project, and the information provided is similar to what is in the Vegetation report for the analysis. However, the linked article is actually about MPB effects in whitebark pine, which is also relevant to the project, and is already part of the Vegetation report for the analysis.*
4	**Long, Richard D., U.S. Department of Agriculture Office of Inspector General "Western Region Audit Report: Forest Service National Fire Plan Implementation" Report No. 08601-26-SF, November 2001.** "We concluded that commercial timber sales do not meet the criteria for forest restoration." http://maps.wildrockies.org/ecosystem_defense/Resources_Species_Topics/Fire/Misuse%20of%20Fire%20Plan%20funds.pdf **Review: Not Relevant to the Project** *The OIG report referenced was an audit of the National Fire Plan (NFP) allocated dollar expenditures. The quote provided above was a reference to a NFP planning dollars expended for a commercial timber sale. The Flint Foothills Project is not a National Fire Plan project.*
4	**Lowe, Kimberly Ph.D. "Restoring Forest Roads." A Northern Arizona University Ecological Restoration Institute publication. Working Paper 12. June, 2005.** "The compaction of forest road soils is known to reduce aeration, porosity, infiltration rates, water movement, and biological activity in soils. Research indicates that soil bulk density, organic matter, moisture, and litter depths are much lower on roads than on nearby forest lands. Macropores, which provide soil drainage and infiltration, have been shown to significantly decrease in size as a result of road construction and use. Reduced infiltration and increased compaction promote soil erosion, especially during the seasonal southwestern monsoon rains (Elseroad 2001)."

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	"Physical disturbances caused by road construction and vehicle use create ideal conditions for colonization by invasive exotic plant species. The use of roads by vehicles, machinery, or humans often aids the spread of exotic plant seeds. Once established, they can have long-term impacts on surrounding ecosystems and can be difficult to remove." "Roads are known to cause habitat fragmentation. Many create ecological 'edges' with different plant species, light levels, and hiding cover, all of which may alter animal survival, reproductive success, and movement patterns. The introduction of exotic plants can disrupt the availability of native vegetation used by wildlife for food and shelter (Trombulak and Frissell 1999)." "Forest roads often develop a water-repellent soil layer caused by lack of vegetative cover and changes in soil composition. This can substantially influence how runoff is processed. Erosion, the formation of water channels beside the road, and increased sediment loads in nearby streams are common results of this process (Baker 2003)." "Because they provide easier access to many forest tracts, forest roads often allow more human-caused fires to be ignited." http://library.eri.nau.edu/gsdl/collect/erilibra/index/assoc/HASH0e8e.dir/doc.pdf **Review: Relevant to the Project** *This publication presents an overview of the problems associated with forest roads and a guide to traditional and novel methods to restore them. It is agreed that roads are a vector for invasive species expansion. However our records indicate that we do not have a significant human-caused fire problem on the Pintler District.* *Temporary roads are one of the issues associated with soil productivity and quality included in the evaluation of the proposed action The publication briefly discusses ecological impacts due to forest roads and methods of restoration. The discussion is very general and the concepts can reasonably be applied to the project area.* *This working paper describes the methods and effects of restoring forest roads. The DEIS addresses the effects of roads on habitat for several wildlife species, mostly pertaining to road densities and secure areas.* *This Research note describes many of the effects of forest roads including sedimentation in a summer monsoon climate in Arizona. Recommendations for restoration of roads may lead to significant benefits, such as reduced soil erosion, or reduced hydrologic changes and improved slope stability. This article points out the benefits of restoring roads. Some roads proposed for construction in this project (4.4 miles) under alternative 2 will be obliterated after the project.*
4	**Luce, Charles H. Ph.D., 2002. "Hydrological processes and pathways affected by forest roads: what do we still need to learn?" Hydrologic Processes: 16, 2901–2904.** "Almost everywhere people live and work they build and use unimproved roads, and wherever the roads go, a range of environmental issues follows." "Among the environmental effects of unimproved roads, those on water quality and aquatic ecology are some of the most critical. Increased chronic sedimentation, in particular, can dramatically change the food web in affected streams and lakes." "The nearly impervious nature of road surfaces (or treads) makes them unique within forested environments and causes runoff generation even in

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	mild rainfall events, leading to chronic fine sediment contributions." "If we look at the issue of what we need to learn or the research priorities for forest road hydrology, I would argue that the areas of cutslope hydrology and effectiveness of restoration efforts are perhaps most critical." "At a few sites in the mountains of Idaho and Oregon a substantial portion of the road runoff (80–95%) came from subsurface flow intercepted by the cutslope (Burroughs et al., 1972; Megahan, 1972; Wemple, 1998)." http://onlinelibrary.wiley.com/doi/10.1002/hyp.5061/abstract **Review: Relevant to the Project** *This invited commentary published in a journal looks at some of the effects of roads on hydrology, turbidity and sedimentation. It suggests new research should focus of road cutslope hydrology and restoration techniques. Chronic sedimentation from roads is very damaging to species food webs. Efforts have been made to model before project and after project sediment delivery to streams from roads, and results are shown in the project hydrology report and the DEIS. BMPs will be used in this project that are designed to significantly reduce sedimentation from project area roads.*
4	**Luce, Charles H. Ph.D., and Beverley C. Wemple Ph.D. "Introduction to Special Issue on Hydrologic and Geomorphic Effects of Forest Roads" Earth Surface Processes and Landforms 26,111-113 (2001)** "Roads have been a part of human landscapes for more than 40 centuries. During the 20th century, technological advances have increased our ability to construct new roads at unprecedented rates and into steeper terrain. In the last half of that century, an extensive network of roads has been constructed in forests and other wildlands to facilitate use and management of natural resources. They are the transportation system that allows transport of timber and minerals from forests and access for recreationists, land managers, firefighters, and residents of villages or vacation homes." http://www.fs.fed.us/rm/pubs_other/rmrs_2001_luce_c001.pdf **Review: Relevant to the Project** *This peer-reviewed journal chapter introduction is a general discussion of some of the effects of roads world-wide on hydrology, turbidity and sedimentation. The effects of existing roads in the project area, and the expected effects of project area roads during the project are discussed in the EIS and in the project hydrology report. BMPs will be used on roads used for this project that are demonstrated to be effective at reducing sediment derived from roads, and reducing the amount of connectedness between roads and streams.*
1	**Mahalovich et al. 2006. "Whitebark Pine Germination, Rust Resistance, and Cold Hardiness Among Seed Sources in the Inland Northwest: Planting Strategies for Restoration." In: Riley, L. E.; Dumroese, R. K.; Landis, T. D., tech. 211igan. 2006. National Proceedings: Forest and Conservation Nursery Associations—2005. Proc. RMRS-P-43. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 160 p. Available at: http://www.rngr.net/nurseries/publications/proceedings**

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	"Since, 2005, rust resistant seed sources have been identified in the Northern Rockies (Mahalovich et al 2006)." http://www.fs.fed.us/rm/pubs/rmrs_p043/rmrs_p043_091_101.pdf **Review: Not Relevant to the Project** *The Flint Foothills proposal does not plan to plant whitebark pine.*
4	**Maholland, Becky and Thomas F. Bullard Ph.D., "Sediment-Related Road Effects on Stream Channel Networks in an Eastern Sierra Nevada Watershed." Journal of the Nevada Water Resources Association, Volume 2, Number 2, Fall 2005.** "Roads in the watershed contribute to sediment production by concentrating runoff, thereby increasing sediment load to the stream network. Most unimproved (dirt) roads connect either directly or indirectly with streams and, therefore, act as extensions of stream networks by effectively increasing watershed drainage density and subsequently sediment loads to streams. In the South Fork subwatershed of Squaw Creek, road connectivity has resulted in an increase in effective drainage density of approximately 250%. Throughout the Squaw Creek watershed, it is estimated that dirt roads potentially contribute as much as 7,793 metric tons/year to the watershed sediment budget." http://www.nvwra.org/docs/journal/vol_2_no_2/NWRAjournal_fall2005_article4.pdf **Review: Relevant to the Project** *This peer-reviewed journal article looks at some of the effects of roads on hydrology, turbidity and sedimentation. It was found that roads in a northern California watershed contributed to sediment production by concentrating runoff, thereby increasing sediment load to the stream network. Most unimproved (dirt) roads connected either directly or indirectly with streams and, therefore, acted as extensions of stream networks by effectively increasing watershed drainage density and subsequently sediment loads to streams.* *This effect will be reduced for the project because BMPs will be used on roads used for this project that are demonstrated to be effective at reducing sediment derived from roads, and reducing the amount of connectedness between roads and streams. An attempt to evaluate road runoff and sedimentation at stream crossings was completed and is disclosed in the project hydrology report and the DEIS.*
4	**Malecki, Ron W. "A New Way to Look at Forest Roads: the Road Hydrologic Impact Rating System (RHIR)" The Road-RIPorter, Autumn Equinox, 2006** "One of the greatest impacts of roads and (especially motorized) trails is their effect on the hydrology of natural landscapes, including the flow of surface and ground water and nutrients. These hydrologic effects are responsible for changes to geomorphic processes and sediment loads in roaded areas (Luce and Wemple 2001)." (pg. 12) http://www.wildlandscpr.org/files/uploads/RIPorter/rr_v11-3.pdf **Review: Not Relevant to the Project** *This non-peer reviewed article is not relevant to the project because road restoration is not the focus of this project. It looks at some of the effects of*

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	roads and promotes road restoration, and addresses the economics of restoration.
4	**MamasHealth.com. "Rotting Wood and how it affects the Environment"** http://www.mamashealth.com/saveearth "Rotting logs are a very common feature of wild ecosystems. Rotting logs recycles nutrients back into the soil and provides a healthy habitat for a wide range of insects, plants, and animals. Rotting log provides homes for small mammals, insects, worms, and spiders. The rich, organic soil provides a unique habitat for fungi, tree seedlings, wildflowers, mosses, and ferns." **Review: Not Relevant to the Project** *The excerpt above is from a short web posting that is not backed by peer reviewed literature. The importance of coarse woody debris recruitment is recognized and provided for by recommendations in the R1 supplement to FSM 2550 based on Graham et al. 1994. Coarse woody debris data ranges from 1 to 17 tons/acre in the proposed harvest activity areas. The soil quality standards (Graham and others 1994) recommend leaving 7-25 tons/acre.*
4	**Mann, Charles C. Ph.D. and Mark L. Plummer Ph.D. "Call for 'Sustainability' in Forests Sparks a Fire" Science 26 March 1999: Vol. 283. No. 5410, pp. 1996 – 1998.** "In hopes of ending conflicts over "multiple use," an independent scientific committee has proposed that "ecological sustainability" should become the principal goal in managing the U.S. national forests and grasslands, which since 1960 have been under a congressional mandate to serve industry, recreation, and conservation all at once." http://www.sciencemag.org/cgi/content/summary/283/5410/1996 **Review: Relevant or Not Relevant to the Project** *This article summarized the process (as of 1999) that a committee of scientists went through to prepare a report with recommendations to the Forest Service for updating the National Forest Management Act by incorporating them into upcoming draft regulations not specific to the Flint Foothills Project. The Forest Service will continue to follow all laws as mandated, including the Multiple Use Sustained Yield Act and the National Forest Management Act.*
1	**Marcot, B. G., and D. D. Murphy. In press. "Population viability analysis and management. " In: Szaro, R., ed. Biodiversity in Managed Landscapes: Theory and Practice. Proceedings of a conference 13-17 July 1992, Sacramento CA. Oxford University Press.** "The cumulative effects of carrying out multiple projects simultaneously across the BDNF makes it imperative that population viability be assessed at least at the forestwide scale (Marcot and Murphy, 1992)." http://www.landsinfo.org/ecosystem_defense/Science_Documents/Marcot_Murphy_1992.pdf **Review: Relevant to the Project** *During Forest Plan revision, species were reviewed for inclusion in the viability analysis. All species determined to be "at-risk" were included. The*

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	viability analysis found that based on Forest Plan management direction, conservation of individual species at the Forest and project level was achieved. Forest Plan management direction has been incorporated into this project. The analysis area used is disclosed in the analysis and varies by species. This project also includes an analysis of forest-associated "at-risk" species and is discussed in the wildlife analysis.
1	**Marcot, B. G., and D. D. Murphy. In press. "Population viability analysis and management. " In: Szaro, R., ed. Biodiversity in Managed Landscapes: Theory and Practice. Proceedings of a conference 13-17 July 1992, Sacramento CA. Oxford University Press.** **Lacey R. C. and T. W. Clark. 1993. Simulation Modeling Of American Marten (*Martes Americana*). In: *Great Basin Naturalist* 53(3), pp. 282-292.** "It is also of paramount importance to monitor population during the implementation of the Forest Plan in order to validate assumptions used about long-term species persistence i.e., population viability (Marcot and Murphy, 1992; Lacy and Clark, 1993)." https://ojs.lib.byu.edu/ojs/index.php/wnan/article/viewArticle/1367 **Review: Relevant to the Project** *During Forest Plan revision, species were reviewed for inclusion in the viability analysis. All species determined to be "at-risk" were included. The viability analysis found that based on Forest Plan management direction, conservation of individual species at the Forest and project level was achieved. Past project information and monitoring information has been incorporated into resource reports and summarized in the DEIS. Past project and monitoring information is on file at the Beaverhead-Deerlodge National Forest. The Lacey and Clark paper addresses a population model called VORTEX that they developed as a management tool to estimate extinction probabilities for American marten populations. The marten may be a management indicator species in some locations, though it is not on the Beaverhead-Deerlodge NF.*
4	**Mark, Jason "Mission Impossible" Earth Island Journal, winter 2009.** "For Pyne and many others who study wildfires, the conventional understanding of firefighting has led us to the misguided conclusion that this is a struggle we can win. In much of the West, fire is an ordinary part of the landscape, a feature as essential to many ecosystems as rivers and grasses. Periodic fires are nothing more than regular disturbances; it is us who have made them into disasters." http://www.earthisland.org/journal/index.php/eij/article/mission_impossible/ **Review: Not Relevant to the Project** *This is an opinion piece not a peer reviewed scientific paper, and the commenter does not relate it to the Flint Foothills Project.*
4	**Marks, Raissa. Fish and Wildlife Habitat Management Leaflet number 37. Published by the Natural Resources Conservation Service, USDA, April 2006.** "Fire releases nutrients and uncovers bare soil. The blackened, bare soil warms quickly, which stimulates soil microbial activity, nutrient cycling, and plant growth. In forests, fire opens up part of the canopy to sunlight, which allows sun-loving plant species to recolonize the site." "Following fires, plant communities go through successional changes. Many native wildlife species and popular game species, such as bobwhite

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	quail, white-tailed deer, and wild turkey, are dependent on periodic fire to create and maintain suitable habitat. Surface fires can stimulate the growth of herbaceous foods for deer, elk, moose, and hares, and can enhance berry production for black bears and other wildlife. Small mammal populations generally increase in response to new vegetation growth, providing a food source for carnivores. Fire can also reduce internal and external parasites on wildlife." (pg. 2) "Natural disturbance such as fires, floods, and herbivory are critical in maintaining valuable ecosystem functions and creating and restoring wildlife habitat." (pg. 7) http://www.sc.nrcs.usda.gov/intranet/Dick%20Yetter%20Information/Technotes%2010-06/ImportofDisturbInHabMgt.pdf **Review: Not Relevant to the Project** *This is a leaflet provided for private landowners explaining the ecological processes associated with natural disturbances. The paper also discusses potential treatment methods to mimic natural disturbances. The paper presents concepts in general terms that apply to ecological systems, but without specific reference to peer-reviewed science, this paper would not be applicable to analysis for effects to individual species addressed in the Flint Foothills Project.*
4	**Martin, Rachel Ph.D. and 221 other Ph.D. Scientists. From an April 16, 2002 letter to President George W. Bush.** "As conservation-minded scientists with many years of experience in biological sciences and ecology, we are writing to bring your attention to the need to protect our National Forests. Logging our National Forests has not only degraded increasingly rare and valuable habitat, but also numerous other services such as recreation and clean water." "Our National Forest System was first established over one hundred years ago to bring an end to the reckless destruction that had ravaged wildlife habitat and watersheds. At the time, Congress acknowledged that establishing National Forests would provide America with diverse wildlife, healthy watersheds, and a sustainable supply of wood products." "Unfortunately, the past emphasis of management has been on logging and the original vision for our National Forests has failed to be fully realized. During the past several decades, our National Forests have suffered from intense commercial logging. Today almost all of our old growth forests are gone and the timber industry has turned our National Forests into a patchwork of clearcuts, logging roads, and devastated habitat. More than 3,000 species of fish and wildlife and 10,000 plant species–including 230 endangered plant and animal species–make their home in National Forests. Scientific research has repeatedly reaffirmed the tenet that wildlife need an abundant, healthy, and intact environment to survive. Unless the destruction of fragile ecosystems is immediately reversed through scientifically based restoration and recovery, the damage done to terrestrial and aquatic habitat will be irrevocable." http://www.pabiodiversity.org/listserve/03-13-03.pdf **Review: Not Relevant to the Project** *This letter was written to then President Bush to urge him to end commercial logging on NFS lands. Commercial logging is still permitted on NFS lands. Forest Plan direction guides management of the Forest. The BDNF Forest Plan considered the effects of management practices on "at risk"*

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	species (found in the Biological Evaluation (Appendix B) for the FEIS for the Forest Plan and the Biological Assessment for wolves and grizzlies). Under review of an appeal, it was found that the Forest Plan achieved conservation of individual species at the project level.
4	**Martinez, Lori. "Applications of Tree-Ring Dating" Laboratory of Tree-Ring Research at the University of Arizona. February, 2000.** "During recent decades, ecologists have learned that forest fires were a pervasive phenomenon in practically all forests of the world, even the rainforests. Humans have severely disrupted the natural pattern of fire across the landscape, especially during the last 100 years. Therefore, if forests are to be returned to their more 'natural' state, fire will have to be reintroduced." http://www.ltrr.arizona.edu/lorim/apps.html **Review: Not Relevant to the Project** *The Flint Foothills Project is not proposing reintroducing fire to return to a more "natural" state; but we agree with the statement.*
4	**Maser, C. Ph.D., and J. M. Trappe Ph.D. "The Seen and Unseen World of the Fallen Tree", 1984 USDA Forest Service, GTR-PNW-164** "Logging removes a mass that harbor a myriad of organisms, from bacteria and actinomycetes to higher fungi. The smaller organisms, not visible to the unaided eye, are still important components of the system." http://www.fs.fed.us/pnw/publications/pnw_gtr164/ **Review: Relevant to the Project** *This paper is relevant to the Flint Foothills project in that reduction in site nutrient capital due to the removal of woody material is one of the issues associated with soil productivity and quality included in the evaluation of the proposed action (Soils section). Maser and Trappe (1984) synthesize "available data on fallen trees in unmanaged old-growth forests" in order to bring awareness to and address research needs in the area of short-term and long-term biological consequences of removing woody debris from streams or forests. The quote above is inaccurate. The section of the paper from which the above was extrapolated and misquoted is referring to characteristics of fallen trees. "Fallen trees harbor a myriad of organisms, from bacteria to actinomycetes or higher fungi. Of these, only some of the fungi might be noticed by the casual observer as mushrooms or bracket fungi. These structures, however, are merely the fruiting bodies produced by mold colonies within the log. Many fungi fruit within the fallen tree, so they are seen only when the tree is torn apart. Even when a fallen tree is torn apart, only a fraction of the fungi present are noticed because the fruiting bodies of most appear only for a small portion of the year. The smaller organisms, not visible to the unaided eye, are still important components of the system" (p. 16, emphasis added). We acknowledge that coarse woody debris (CWD) plays an important role in soil productivity and quality. CWD is one soil quality indicator which influences soil hydrology, biology, nutrient cycling, and soil stability and support functions which are indicators of soil productivity (USDA Forest Service, 2010). The removal of woody material from the site is common due to whole tree harvesting practices. The R1 supplement to FSM 2550 recommends following the guidelines set forth in Graham et al. 1994 in determining the amount of coarse woody debris to be left onsite. By following prescribed project design features (page xx of the DEIS) the appropriate amount of CWD would be left on site in turn providing habitat for the smaller unseen organisms.*

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4	**Maser, C. Ph.D., R. F. Tarrant, J. M. Trappe Ph.D., and J. F. Franklin Ph.D. 1988. "The Forest to the Sea: A Story of Fallen Trees" USDA Forest Service, GTR-PNW-GTR-229** "Logging removes mature and maturing trees which conserve essential elements, whereas the area containing new very young planted trees following logging are susceptible to erosion and essential element loss." (pg.5) "Logging removes tree parts that would have created and maintained diversity in forest communities." (pg. 44) http://www.fs.fed.us/pnw/publications/pnw_gtr229/ **Review: Relevant to the Project** *This paper is relevant to the Flint Foothills project in that reduction in site nutrient capital due to the removal of woody material is one of the issues associated with soil productivity and quality included in the evaluation of the proposed action (Soils section). Most of the information is specific to coastal Oregon and while the ecosystem is completely different from that of the Flint Foothills project area, the concepts can be reasonably applied to the project area. Maser et al. (1988) document the importance of large, dead woody debris in long term forest productivity. The quotes above are inaccurate. The section of the paper from which the first 'quote' was extrapolated is referring to characteristics of a coastal Oregon forest. "The forest's character changes with succession. Net primary productivity is greater in young forests than in old ones. Old forests conserve nutrients, whereas very young forests are susceptible to erosion and nutrient loss (Franklin and others 1981)" (p. 5, emphasis added). The section of the paper from which the second 'quote' was extrapolated is referring to the benefits of fallen trees. "Decaying, fallen trees contribute to long-term accumulation of soil organic matter, partly because the carbon constituents of well-decayed wood are 80-90 percent residual lignin and humus (Means and others 1985). Decaying wood in the soil and establishment of conifer seedlings and mycorrihizal fungi on dry sites are positively correlated (Harvey and others 1987). Fallen trees also create and maintain diversity in forest communities" (p. 44, emphasis added). We acknowledge that coarse woody debris (CWD) plays an important role in soil productivity and quality. CWD is one soil quality indicator which influences soil hydrology, biology, nutrient cycling, and soil stability and support functions which are indicators of soil productivity (USDA Forest Service, 2010). The removal of woody material from the site is common due to whole tree harvesting practices. The R1 supplement to FSM 2550 recommends following the guidelines set forth in Graham et al. 1994 in determining the amount of coarse woody debris to be left onsite. By following prescribed project design features the appropriate amount of CWD would be left on site.*
1	**McArthur, E. 1990. "Introduction: cheatgrass invasion and shrub die-off." Pages 1-2 in Proceedings – Symposium on cheatgrass invasion, shrub die-off and other aspects of shrub biology and management. USDA Forest Service. Intermountain Research Station. General Technical Report INT-276.** As related to letter 1, comment 35; additional literature to address **Review: Not Relevant to the Project** *The document could not be located on the internet. However, other articles that referenced this symposium document focused on shrublands such as the vast sagebrush communities of Southern Idaho, Eastern Oregon and Nevada. These sites within the Great Basin have drastically been*

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	influenced by cheatgrass and fire. The Flint Foothills project area has a very small cheatgrass and sage brush component. These sites are not located within any proposed units.
4	**McCashion, J. D. and R. M. Rice Ph.D. 1983. "Erosion on logging roads in northwestern California: How much is avoidable?" Journal of Forestry 8(1): 23-26.** "A study was made on 344 miles of logging roads in northwestern California to assess sources of erosion and the extent to which road-related erosion is avoidable. At most, about 24 percent of the erosion measured on the logging roads could have been prevented by conventional engineering methods. The remaining 76 percent was caused by site conditions and choice of alignment. On 30,300 acres of commercial timberland, an estimated 40 percent of the total erosion associated with management of the area was found to have been derived from the road system." http://www.fs.fed.us/psw/rsl/projects/water/McCashion.pdf **Review: Relevant to the Project** *This peer-reviewed journal article looks at some of the effects of roads on hydrology, turbidity and sedimentation in Northern California. The focus of the article is identifying how much erosion can be avoided on forest roads, and the article points out that not all erosion from forest roads is preventable. The study looked at 344 miles of logging roads in northwestern California to assess sources of erosion and the extent to which road-related erosion is avoidable. At most, about 24 percent of the erosion measured on the logging roads could have been prevented by conventional engineering methods.* *For this project, sedimentation from project forest haul roads has been estimated using the WEPP Roads model and results are disclosed in the project hydrology report. BMPs that have been demonstrated to be effective at controlling sediment will be used to minimize sedimentation from project roads. Model results and monitoring have shown that significant reductions in sedimentation would occur from applying BMPs to roads.*
4	**McDaniel, Josh. 2007. "The Zaca Fire: Bridging Fire Science and Management" Widland Fire Lessons Learned** "The experience of the Zaca Fire demonstrates a window of opportunity to improve the link between science and management. A major concern often expressed in both fire research and fire management circles is that there is a lot of science being produced, but very little that can or is being incorporated (depending on your perspective) into fire management. There may be a current opening to change that state of affairs." http://www.wildfirelessons.net/Additional.aspx?Page=110 **Review: Not Relevant to the Project** *This is an opinion and not a peer reviewed scientific paper and the commenter does not address how their statement either supports or is in contrast to our project.*
4	**McFero III, Grace, J. "Sediment Plume Development from Forest Roads: How are they related to Filter Strip Recommendations?" An ASAE/CSAE Meeting Presentation, Paper Number: 045015, August 1-4, 2004.**

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	"Research has shown that roads can have adverse impacts on the water quality on the forest landscape (Authur et al. 1998; Binkley and Brown 1993; Megahan et al. 1991). The forest road system has been identified by previous research as the major source of soil erosion on forestlands (Anderson et. Al 1976; Patric 1976; Swift 1984; Van Lear et al. 1997). Furthermore, roads are cited as the dominant source of sediment that reaches stream channels (Packer 1967; Trimble and Sartz 1957; Haupt 1959)." http://www.srs.fs.usda.gov/pubs/ja/ja_grace017.pdf **Review: Relevant to the Project** *This article looks at some of the effects of roads on turbidity and sedimentation in Alabama and Georgia. This study was undertaken to assess sediment travel distances downslope of forest roads and characterize the factors influencing these distances. Sediment plume lengths were measured at 235 sites downslope from the outlet of road drainage structures. Sites included a range of downslope gradients, road gradients, road section lengths,and flow path conditions. The initial analysis found that drainage spacing was within BMP recommendations for 70 and 90 percent of the plumes evaluated for Alabama and Georgia, respectively. Sediment plume lengths ranged from 3 to 140 meters with a mean of 30 meters. This study is a hard look at effectiveness of BMPs. Major factors influencing sediment plume lengths were slope gradients, and the extent of road maintenance.* *For this project, BMPs that have been demonstrated to be effective at controlling sediment will be used to minimize sedimentation from project roads. Model results and monitoring have shown that significant reductions in sedimentation would occur from road maintenance and applying BMPs to roads.*
4	**McIntosh, B.A., J.R. Sedell, J.E. Smith, R.C. Wissmar, S.E. Clarke, G.H. Reeves, and L.A. Brown. 1994. "Management history of eastside ecosystems: changes in fish habitat over 50 years, 1935-1992." 1994 GTR-321 93-181.** "In addition to the direct effects of habitat loss and fragmentation, logging typically reduces ecosystem health by: a) damaging aquatic habitats through siltation, reduction in stream complexity and increased water temperatures." **This link opens to the PNW Region 6 Research Station Web page and the document is there in Parts A-B.** http://www.fs.fed.us/pnw/publications/pnw_gtr321/ **Review: Not Relevant to the Project** *The study addresses changes in fish habitat over a 50-year time span in four streams in the Columbia River basin in Washington and Oregon. Watersheds with high quality fish habitat or high potential for restoration were identified. This study is not applicable to the streams and fish habitat in the Flint Foothills project area.*
4	**McClellan, Bruce N. "Relationships between Human Industrial Activity and Grizzly Bears" Bears: Their Biology and Management, Vol. 8 International Conference on Bear Research and Management. February 1989 (1990), pp. 57-64** "Road construction in remote areas appears to be the major long term impact of resource extraction industries and the most significant problem

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	facing grizzly bears in most locations. Open roads are an influence in all 5 ways that people affect bears. Vehicles on roads can harass bears, displace them from quality habitats, and cause reduced bear use of altered habitats, such as cutting units. Bears that are displaced from roads may cause social disruption in areas away from roads. Finally, roads permit access for many people and some of these will shoot bears." (Pg. 62) http://www.bearbiology.com/fileadmin/tpl/Downloads/URSUS/Vol_8/McClellan_8.pdf **Review: Relevant to the Project** *Roads (and motorized trails) have been recognized to affect wildlife use (including grizzly bears) in an area. As a result, the Forest Plan includes goals, objectives and standards to provide wildlife secure areas. Analysis of the effects of the project on wildlife secure areas and open motorized road and trail densities is provided in the Flint Foothills Project wildlife analysis. All temporary roads would be obliterated after use and there would be no new permanent roads open to public access under either action alternative.*
1	**Mealey, Stephen P., 1983. Wildlife Resource Planning Assistance to the Payette and Boise National Forests. April 1, 1983. U.S. Forest Service, Land Management Planning Systems, 3825 E. Mulberry, Fort Collins, Colorado 80524.** "The FS has stated: "Well distributed habitat is the amount and location of required habitat which assure that individuals from demes,1 distributed throughout the population's existing range, can interact. Habitat should be located so that genetic exchange among all demes is possible." (Mealey 1983.)" **Review: Not Relevant to the Project** *The citation consists of steps to follow to address Forest-level planning requirements concerning species viability. During the Beaverhead-Deerlodge Forest Plan revision, species were reviewed for inclusion in the viability analysis. All species determined to be "at-risk" were included. The viability analysis found that based on Forest Plan management direction, conservation of individual species at the Forest and project level was achieved.*
4	**Megahan, Walter F. Ph.D. "Predicting Road Surface Erosion from Forest Roads in Washington State" from a presentation presented at the 2003 Geological Society of America meeting.** "Erosion from forest roads can be a large source of sediment in watersheds managed for timber production." http://gsa.confex.com/gsa/2003AM/finalprogram/abstract_67686.htm **Review: Not Relevant to the Project** *This peer-reviewed article is not relevant to the project because it describes a sediment modeling technique used in Washington State that was not used for this project.*

[1]Subpopulations.

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4	**Melle, Ann R. "The U.S. Forest Service Approach to Forest Law Enforcement" A presentation to the East Asia Ministerial Conference, September 12, 2001.** Ms. Melle is the Asst. Director of Law Enforcement and Investigations, USDS[A] Forest Service "The FS manages the National Forest System's natural resources with a commitment to long term ecosystem sustainability, multiple use, local community involvement and economic stability, interaction of social and cultural values with forest resource management, and the use of management practices based on the best science available." http://siteresources.worldbank.org/INTINDONESIA/FLEG/20171799/Anne_Melle.pdf **Review: Not Relevant to the Project** *The focus of the presentation is on the history of the LEI (Law Enforcement and Investigations) and "Sawlog Enforcement Program" (addressing timber theft).The article is not relevant to the Flint Foothills Vegetation Management Project, though we agree that the principles stated in the excerpt are relevant to the project. With respect to "the best science available," the project considers the latest and best science available; over 100 references are cited in the analyses.*
1	**Montana State Noxious Weed List** http://www.weedawareness.org/weed_list.html **Review: Relevant to the Project** *The actual weed list is found at http://agr.mt.gov/agr/Programs/Weeds/PDF/weedList2010.pdf*
1	**Montana Department of Fish, Wildlife and Parks. 1997. Status and distribution of the pygmy rabbit in Montana: final report. Montana Department of Fish, Wildlife and Parks. PO Box 173220, Bozeman, MT.** **http://fwpiis.mt.gov/content/getItem.aspx?id=8220** As related to letter 1, comment 35; additional literature to address **Review: Relevant to the Project** *This survey report documents observed pygmy rabbit locations and delineates the known distribution of the species in western Montana at the time the report was issued. Known occurrences and range delineations in general are utilized in the Flint Foothills wildlife analysis to aid in determining potential project impacts to the species and its habitats.*
4	**Moring, John R. Ph.D. 1975. "The Alsea Watershed Study: Effects of Logging on the Aquatic Resources of Three Headwater Streams of the Alsea River, Oregon – Part III." Fishery Report Number 9 Oregon Department of Fish and Wildlife.** "Logging practices can indirectly result in changes in the biological components of a stream, and can have direct and indirect on the physical

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	environment in streams. The primary environmental changes of concern are the effects of siltation, logging debris, gravel scouring, destruction of developing embryos and alevins, blockage of streamflow, decrease in surface and intragravel dissolved oxygen, increase in maximum and diel water temperatures, changes in pool/riffle ratios and cover, redistribution of fishes, reduction in fish numbers, and reduction in total biomass." http://www.for.gov.bc.ca/hfd/library/ffip/Moring_JR1975b.pdf **Review: Not Relevant to the Project** *This study assesses effects of logging practices on small headwater streams important for spawning and rearing areas for several species of salmon and trout in coastal Oregon.The logging was implemented over a 15-year period, 1959-1973. The Flint Foothills Project in Montana is designed with features and riparian habitat conservation areas that apply parameters to reduce effects.*
4	**Naeem, Shahid Ph.D., F.S. Chapin III Ph.D., Robert Costanza Ph.D., Paul R. Ehrlich Ph.D., Frank B. Golley Ph.D., David U. Hooper Ph.D. J.H. Lawton Ph.D., Robert V. O'Neill Ph.D., Harold A. Mooney Ph.D. Osvaldo E. Sala Ph.D., Amy J. Symstad Ph.D., and David Tilman Ph.D. "Biodiversity and Ecosystem Functioning: Maintaining Natural Life Support Processes." Issues in Ecology No. 4. Fall 1999.** "Biodiversity in managed ecosystems is poor. Less biodiverse communities and ecosystems are more susceptible to adverse weather (such as drought) and exotic invaders, and have greatly reduced rates of biomass production and nutrient cycling." "All of these studies show that ecosystem functioning is decreased as the number of species in a community decreases. Declines in functioning can be particularly acute when the number of species is low, such as in most managed ecosystems including croplands or timber plantations." "Recent evidence demonstrates that both the magnitude and stability of ecosystem functioning are likely to be significantly altered by declines in local diversity, especially when diversity reaches the low levels typical of managed ecosystems." http://www.esa.org/science_resources/issues/TextIssues/issue4.php **Review: Relevant to the Project** *This report provides an overview of ecosystem functioning, reviews the distinction between taxonomic biodiversity and functional diversity, and evaluates the current status of research concerning ecosystem responses to changes in diversity.* *The 2009 Forest Plan has a Vegetation Goal for Biodiversity on page 43, which reads: "A variety of disturbance processes are managed or allowed to occur that produce resilient vegetation communities able to sustain diversity in the face of uncertain future climate-influenced disturbances. Resilient vegetation communities will have a mosaic of species and age classes of trees, shrubs, grasses, and forbs for animal forage and cover, and perpetuate the diversity of plants and the microbial and insect communities upon which they are dependent. Old growth is managed on a forestwide basis and is well distributed." Effects to the wildlife resource addressed in the DEIS includes impacts to ecosystem function as it pertains to species' habitats.*
4	**Nappi, Antoine Ph.D., Pierre Drapeau Ph.D., Jean-François Giroux Ph.D. and Jean-Pierre Savard Ph.D. "Snag use by foraging black-**

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	backed woodpeckers (*Picoides articus*) in a recently burned eastern boreal forest." The Auk 120(2): 505-511. 2003. "Contrary to what you may think, a forest fire does not reduce everything to a lifeless ash. Instead, it leaves behind a landscape of blackened trees interspersed with remnants of green, intact forest. Post-fire specialists such as wood-boring insects quickly colonize the dead trees (snags), attracting an array of woodpeckers." "Identifying the ecological value of a post-fire structure and the characteristics that make it attractive to wildlife is important." http://www.bioone.org/doi/full/10.1642/0004-8038%282003%29120%5B0505%3ASUBFBW%5D2.0.CO%3B2 **Review: Not Relevant to the Project** *The citation refers to a peer-reviewed science investigation concerning black-backed woodpecker use of post-fire eastern black spruce stands in Quebec, Canada. The Flint Foothills Project does not contain or propose to treat post-fire areas. In addition, species responses to conditions in eastern black spruce stands in Quebec are likely not applicable to lodgepole pine forests conditions in the Flint Foothills project area.*
4	**Nappier, Sharon. "Lost in the Forest: How the Forest Service's Misdirection, Mismanagement, and Mischief Squanders Your Tax Dollars" Taxpayers for Common Sense, 2002.** "As a result of the Forest Service's well-documented mismanagement over many years of the timber sale program, taxpayers also have been stuck with the tab for hundreds of millions of dollars worth of subsidies to a profitable timber industry." http://www.ourforests.org/fact/lostintheforest.pdf **Review: Not Relevant to the Project** *The article cited is an opinion paper offering review and comment regarding the road maintenance backlog on National Forest System lands, the costs associated with the construction of new logging roads, the taxpayer's subsidies for road construction and the Forest Service inability to provide data that displays the cost of its timber sale program. The author describes this as "chronicled waste, fraud, and fiscal abuse at the agency." The citation is taken from the executive summary of the document and refers to the Bush administration's failure to address road maintenance while advancing an agenda that promotes new road construction. The article also cites a 2001 GAO report associated with the cost of the timber sales program. In the article, the Forest Service commented that they will be implementing a new accounting system to track and evaluate the timber sale program.* *In the article five recommendations were made to the Forest Service, not directly referencing the Flint Foothills project, that are national in scale and deal with Forest Service policy at the Washington Office level.*
4	**Noble, Ian R. and Rodolfo Dirzo Ph.D. "Forests as Human-Dominated Ecosystems." Science Vol. 277. No. 5325, pp. 522 – 525. 25 July 1997.** "Agroforestry does reduce biodiversity. In forests used for logging, whole-landscape management is crucial. Here, emphasis is placed on areas of intensive use interspersed with areas for conservation and catchment purposes. Management strategies for sustainable forestry are being

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	developed, but there is a need for further interaction among foresters, ecologists, community representatives, social scientists, and economists." http://www.sciencemag.org/cgi/content/abstract/277/5325/522?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&fulltext=logging&searchid=1136659907310_5043&FIRSTINDEX=0&journalcode=sci **Review: Not Relevant to the Project** *This opinion piece in a magazine does not address any aspect of the Flint Foothills project.*
4	**Northup, Jim. 1999. "Public Wants More Wilderness, Less Logging on Green Mountain NF". Press Release by Forest Watch, a Vermont-based environmental organization.** "The U.S. Forest Service has been sitting on a public opinion survey it commissioned, not knowing what to do with the results. The problem is that most people surveyed want more wilderness areas and less logging on the Green Mountain National Forest (GMNF), while the federal agency seems to want to build more roads and cut more trees." "The survey conducted by Dr. Robert Manning of the School of Natural Resources at the University of Vermont, polled 1,500 Vermont households in the spring of 1995. A survey with similar results was completed last fall for the White Mountain National Forest in New Hampshire. 'It is clear that New England residents value the national forest for many reasons, but non-material values, such as aesthetics and ecological protection, are more important than material values, such as economic development,' said Dr. Manning." "The responses to several survey questions indicate a strong public desire for more areas of wild, untouched nature on the GMNF and less roadbuilding and logging. Very few people supported clearcutting and other types of industrial logging, especially if natural beauty or wildlife habitat were harmed." "For example: 82 percent wanted to ban clearcutting, 82 percent said logging should not hurt scenic beauty, 80 percent of the respondents wanted to protect remaining undisturbed forest; and 72 percent urged prohibition of logging if bear or other wildlife habitat would be harmed." "Only 36 percent felt that management of the GMNF should emphasize timber and lumber products; and only 15 percent felt that jobs are more important than protection of endangered species." "'The results of this survey and a similar one on the White Mountain National Forest in Vermont should serve as loud wake-up calls to the U.S. Forest Service,' said Northup. 'Forest Service officials have two choices: either begin a major overhaul of the agency's management programs or ignore the wishes of the people they are supposed to serve'." http://www.forestwatch.org/content.php?id=10

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	Review: Not Relevant to the Project *This is an interesting survey but the population that was sampled was Vermont residents, so results are not representative of the larger U.S. population.*
4	**Noss, Reed F. Ph.D. 1987. "Roads and their Impacts" in Natural Areas Journal.** "Studies involving some small and medium-sized mammals have shown that they will usually not cross roads, including forest roads not open to public traffic. Roads result in emissions and disturbances such as noise, dust, light, exhaust, increased salinity in ditches and waterways, and chemical and mechanical vegetation control. Roadkill in Ontario is high for many species. Roads fragment, eliminate and change habitats Habitats are directly lost to road construction and to the activities permitted by road access. Habitat conversion from forest 'interior' to forest 'edge' results in changes and declines in interior-dependent species. Fragmented forest habitats are more susceptible to nest predation and parasitism, and reduce the abundance of some migratory species, such as some declining neotropical migrants. Many animals avoid areas with high road densities. Roads increase access Harvest pressures on fish and wildlife increase dramatically in newly roaded areas. Almost all wilderness roads are built to remove natural resources. Roads are unnatural travel corridors and migration routes Carnivores such as wolves and coyotes will use roads as corridors into previously difficult-to-access areas, increasing predation. Non-native plants and animals use roads as corridors for dispersal, and compete with native flora and fauna. Roads erode soils and impact waterways Road construction and maintenance, and subsequent erosion and gullying, flush road materials into streams and lakes, harmfully altering ecosystems and fish habitats." http://www.ontarionature.org/brochures/endoftheroad/impact.html **Review: Relevant to the Project** T*he paper was no longer available via the link. However, the sections included above lists potential effects of roads on wildlife. Many of the effects discussed in this paper are those associated with paved, well-maintained, high-speed roads. However, it is recognized that lower-standard, unpaved Forest roads have effects as well. The effects of displacement and avoidance were addressed in the Forest Plan and it provides wildlife secure habitat through management of open motorized road and trail densities. This direction is discussed in the Flint Foothills wildlife analysis. Effects of roads on aquatic systems and species are discussed in the aquatics analysis of the EIS.*

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1	**Noss, Reed F. Ph.D. 1993. "The Wildlands Project Land Conservation Strategy." *Wild Earth Journal, Special Issue*: 10-26** "State-of-the-art conservation biology and the principles that underlie the agency's policy of "ecosystem management" dictate an increasing focus on the landscape-scale concept and design of large biological reserves accompanied by buffer zones and habitat connectors as the most effective (and perhaps only) way to preserve wildlife diversity and viability (Noss 1993)." **Review: Not Relevant to the Project** *The referenced article was not available on the Council's website. Per the citations provided, species were reviewed for inclusion in the viability analysis as part of the Forest Plan Revision process. All species determined to be "at-risk" were included. The viability analysis found that based on Forest Plan management direction, conservation of individual species at the Forest and project level was achieved. Forest Plan management direction has been incorporated into this project. The analysis area used is disclosed in the analysis and varies by species. This project also includes an analysis of forest-associated "at-risk" species and is discussed in the wildlife analysis.*
4	**Noss, Reed F., Ph.D. 1995. "The Ecological Effects of Roads or the Road to Destruction." *Wildlands CPR*** "Roads sever animal and plant habitats and populations" "Nothing is worse for sensitive wildlife than a road. Over the last few decades, studies in a variety of terrestrial and aquatic ecosystems have demonstrated that many of the most pervasive threats to biological diversity – habitat destruction and fragmentation, edge effects, exotic species invasions, pollution, and overhunting – are aggravated by roads. Roads have been implicated as mortality sinks for animals ranging from snakes to wolves; as displacement factors affecting animal distribution and movement patterns; as population fragmenting factors; as sources of sediments that clog streams and destroy fisheries; as sources of deleterious edge effects; and as access corridors that encourage development, logging and poaching of rare plants and animals." "Most public agencies disregard the ecological impacts of roads, and attempt to justify timber roads as benefiting recreation and wildlife management. Even when a land manager recognizes the desirability of closing roads, he or she usually contends that such closures would be unacceptable to the public." "The Forest Service and other public agencies will claim that road closures, revegetation, and other restorative measures are too expensive to be implemented on a broad scale. But much of the approximately $400 million of taxpayers' money squandered annually by the Forest Service on below-cost timber sales goes to road-building. Road maintenance is also expensive. Virtually all of this money could be channeled into road closures and associated habitat restoration. This work would be labor-intensive, and providing income to the many laid off loggers, timber sale planners, and road engineers – for noble jobs, rather than jobs of destruction!" http://www.wildlandscpr.org/ecological-effects-roads **Review: Relevant to the Project** *This report focuses on roads, highlighting common economic perspective on roads. Road work is generally limited to routes required to haul cut timber, or work to improve the ecological effects of existing roads. Many of the effects discussed in this paper are those associated with paved, well-*

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	maintained, high-speed roads. However, it is recognized that lower-standard, unpaved Forest roads have effects as well. The effects of displacement and avoidance were addressed in the Forest Plan and it provides wildlife secure habitat through management of open motorized road and trail densities. This direction is discussed in the Flint Foothills wildlife analysis (especially grizzly bear, wolverine and elk sections). *This project calls for 7.2 miles of temporary road that will be closed to public use and it will not be used for wildlife management. Temporary roads will be obliterated upon completion of scheduled activities. The construction of 1.3 miles of NFS road that will be managed as closed to the public are addressed as well.*
4	**Noss, Reed F. Ph.D., Jerry F. Franklin Ph.D., William Baker, Ph.D., Tania Schoennagel, Ph.D., and Peter B. Moyle, Ph.D. 2006. "Ecological Science Relevant to Management Policies for Fire-prone Forests of the Western United States" Society for Conservation Biology, February 24, 2006.** "Trees that survive the fire for even a short period of time are critical as seed sources and as habitat that will sustain many elements of biodiversity both above and below ground. The dead wood, including large snags and logs, is second only to live trees in overall ecological importance." http://www.nifc.gov/fuels/downloads/planning/EcologicalScience.pdf **Review: Relevant or Not Relevant to the Project** *The document was not located. From the quote above, this reference is not relevant as the project is not a post-fire proposal. A panel of authors summarizes key science findings associated with restoration of characteristic fire regimes. The Flint Foothills DEIS acknowledges the importance of snags and downed logs to wildlife and meets Forest Plan standards that direct retention of these habitat components.*
4	**Oko, Dan and Ilan Kayatsky. "Fight Fire with Logging?" *Mother Jones,* August 1, 2002** "Still, forestry experts warned in the 2000 plan that logging should be used carefully and rarely; in fact, the original draft states plainly that the "removal of large merchantable trees from forests does not reduce fire risk and may, in fact, increase such risk." "Now, critics charge that the Bush administration is ignoring that warning. Neil Lawrence, a policy analyst with the Natural Resource Defense Council, claims that Washington has taken a far more aggressive approach to incorporating commercial logging in its wildfire prevention plans. As a result, Lawrence and other critics say, the National Fire Plan is becoming a feeding ground for logging companies. Moreover, critics claim the administration's strategy, far from protecting the lives and homes of those most at risk, could actually increase the likelihood of wildfires." http://www.motherjones.com/news/feature/2002/08/fireplan.html **Review: Not Relevant to the Project** *This is an opinion and not a peer reviewed scientific paper and the commenter does not address how their statement either supports or is in contrast to our project. In addition the Flint Foothills project does not propose to remove large merchantable trees to reduce fire risk.*
4	**Ortega, Yvette K.; Capen, David E. 1999. "Effects of forest roads on habitat quality for Ovenbirds in a forested landscape" Auk. 116(4): 937-946.**

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	"Numerous studies have reported lower densities of breeding Ovenbirds (*Seiurus aurocapillus*) adjacent to forest edges. However, none of these studies has considered habitat use and reproductive success to address mechanisms underlying the observed pattern, and most were conducted in fragmented landscapes and ignored juxtapositions of forest with narrow openings such as roads. We studied the influence of forest roads on Ovenbird density in an extensively forested region of Vermont, evaluating habitat use and reproductive success relative to mechanisms proposed to explain the density-edge relationship. Territory densities on seven study plots were 40% lower within edge areas (0 to 150 m from unpaved roads) than within interior areas (150 to 300 m from roads). We simulated the distribution of Ovenbird territories and concluded that passive displacement, where birds perceive habitat interfaces as boundaries and limit their territories entirely to forest habitat, did not account for the observed density-edge pattern. Territory size was inversely related to distance from roads, providing an alternative explanation for reduced densities near edges and suggesting that habitat quality was higher away from roads. Pairing success was lower within edge areas than within interior zones, but the difference was not statistically significant. The proportion of males that produced fledglings did not differ between edge and interior areas. We conclude that habitat quality for Ovenbirds may be lower within 150 m of unpaved roads in extensive forested landscapes, affecting territory density and possibly reproductive success." http://www.fs.fed.us/rm/pubs_other/rmrs_1999_ortega_y001.html **Review: Not Relevant to the Project** *Ovenbirds have not been identified as a species at-risk and were not analyzed for the Forest Plan or this project.*
4	**Parfitt, Ben and Laurel Brewster. 2000. "Muddied Waters: The Case for Protecting Water Sources in B.C." A publication of: the Tuwanek Ratepayers Association, the Red Mountain Residents Association, the B.C. Watershed Stewardship Alliance, and the B.C. Tap Water Alliance.** "Each year in British Columbia more than 200,000 hectares of forest is logged, the majority of it clearcut." "Almost all of that logging activity takes place in watersheds or forested valleys that contain important surface water supplies such as reservoirs, lakes, rivers or streams. Often, valleys contain a multitude of water bodies connected with one another. The small ephemeral streams in a valley's upper reaches feed into bigger creeks that carry water into valley-bottom rivers." "This report examines the costs to human communities and fisheries when logging-related damage to these interconnected and finely balanced water systems occurs." "As this report reveals, the costs are extremely high. If the 100 B.C. communities outside of Vancouver and Victoria who currently use unfiltered water from surface sources were forced to filter their water to get rid of unwanted sediments, the cost would be about $700 million. The ongoing cost of running the new filtration plants would be about $30 million annually. Such costs can be avoided, but only if land-use practices around surface supplies don't muddy the water." "Logging in watersheds also poses significant threats to the environment, particularly the critically important in-stream habitats of spawning and rearing salmon. Every time a logging road or logging operation triggers increased water runoff into streams, chances are high that elevated levels of sediment and debris are washed into waterways inhabited by fish."

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	"To date, more than $300 million in public money has been channeled through the Crown Corporation, Forest Renewal BC, to pay for "watershed restoration" projects in the province. Expenditures to clean up streams and surrounding hillsides damaged by logging activities continue. It was recently estimated that up to 40 years of funding might be required to rehabilitate salmon habitat and surrounding forests damaged by logging." "Clearly, the public has paid and will continue to pay a steep price for logging practices that damage surface waters." http://www.library.for.gov.bc.ca/ipac20/ipac.jsp?session=1RW012320B660.2434272&profile=mof&source=~!forest&view=subscriptionsummary&uri=full=3100001~!46491~!9&ri=1&aspect=basic_search&menu=search&ipp=20&spp=20&staffonly=&term=parfitt&index=.GW&uindex=&aspect=basic_search&menu=search&ri=1#focus **Review: Not Relevant to the Project** *The article was not available on-line. This report is specific to British Columbia and discusses and the price communities pay to treat surface water affected by logging-related sediment and the long-term costs to restore impacted fish habitat. It is not specific to the Flint Foothills Project area in Montana or surrounding communities.*
4	**Parks and Recreation-Troy-Michigan. "Why Does the City Leave Dead Trees" June, 2007.** http://troymi.gov/ParksRec/Trees/DeadTrees.asp "Scientists believe a scattering of dead trees goes far beyond looks. Dead trees support birds that actually decrease populations of harmful insects. Studies by Cooperative Extension Service have demonstrated that a large population of forest birds appreciably reduces problems for tree owners caused by insects and small mammals. An example is the woodpecker. It can hold down bark beetles and can control as much as 65% of emerging pine beetles. All ash trees dying from emerald ash borer show aggressive signs of feeding woodpeckers. Dead branches serve as necessary perches for hawks, owls and similar birds of prey. Birds that play and important role in the control of mice, gophers and rabbits that wreak havoc with our landscapes, lawns and gardens. To that end, as the City goes through its parks and natural areas, removing dead trees, we will leave some standing. Additionally, in unobtrusive areas, we intended to leave piles of branches and the occasional log. All this in the hope that the diversity of wildlife in Troy's urban forest will flourish and, in so doing improve the quality of our lives as well." **Review: Not Relevant to the Project** T*he citation consists of a website bulletin provided by the Park and Recreation Department, Troy, Michigan, explaining the City's dead and dying urban tree removal policy. The contents of the bulletin have little applicability to the wildlife analysis conducted for the Flint Foothills Project due to a lack of specificity associated with snag-dependent species and conditions in the analysis area.*
1	**Paul F. Hessburg and John F. Lehmkuhl. 1999. "Science Peer-Review Summary of the Wenatchee National Forest's Dry Forest Strategy." USDA Forest Service, Pacific Northwest Research Station, Wenatchee, WA. June 1, 1999** "Also, Hessburg and Lemkuhl (1999) suggest that prescribed burning alone can be utilized in many cases—possibly here—where managers

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	typically assume mechanical fuel reductions must be used." http://www.subtleenergies.com/ormus/Fire/dryforest.htm **Review: Not Relevant to the Project** *The peer-review summary was of a specific project on the Wenatchee National Forest. The BDNF project has many of the same elements as the project referenced, and includes similarly designed treatments, including prescribed burning. The quote above suggests that the document referenced speaks to using prescribed burning alone. Reviewing the document, it actually recommends a combination of thinning and burning as preferred treatments. The Flint Foothills Project is not proposing using prescribed fire or mechanical means to reduce fuels.*
1	**Pellant, M. 1990. The cheatgrass-wildfire cycle – are there any solutions: Pages 11-18 in Proceedings – Symposium on cheatgrass invasion, shrub die-off and other aspects of shrub biology and management. USDA Forest Service. Intermountain Research Station. General Technical Report INT-** As related to letter 1, comment 35; additional literature to address **Review: Relevant to the Project** See previous response on this citation.
4	**Perry, David A. Ph. D. From testimony at a Senate Field Hearing on Forest Health. August 29, 1994.** "Before discussing the above points in more detail, it is important to specify what the term health as applied to a forest ecosystem means to me; I believe my views reflect those of most ecological scientists. A healthy system is one that retains the integrity of its basic structure and processes, including viable populations of indigenous species. Some level of disease and tree death is normal and beneficial in forests; ecosystem health is not so much the absence of disease and death as it is the ability to contain these natural forces within certain bounds and the robustness to resist or recover quickly from environmental stresses. These system properties of "resistance" and "resilience" are closely associated in turn with species diversity and in particular with the multiplicity of interactions among species that compose the system. Although healthy trees are prerequisite to healthy forest ecosystems, health encompasses much more than trees, and forest health correlates much more closely with structure and processes than with how fast trees are growing." http://www.subtleenergies.com/ormus/Fire/D_PERRY.htm **Review: Not Relevant to the Project** *This comment is taken from a testimony that 'refers primarily to forest of Idaho, eastern Oregon and eastern Washington'. The discussion quoted mirrors Beaverhead-Deerlodge Forest Plan vegetation objectives, which the project purpose and need and proposal design follow.*
4	**Peters, Robert L. Ph.D, Evan Frost, and Felice Pace. 1996 "Managing for Forest Ecosystem Health: A Reassessment of the 'Forest Health Crisis"**

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	"Traditionally, the term 'forest health' has been used in a limited, utilitarian sense by professional foresters to refer to the growth and vigor of trees (see Kolb et al. 1994). For example, according to one Forest Service publication, a forest is healthy when "biotic and abiotic influences on forests do not threaten management objectives now or in the future" (USFS 1993). From this perspective, a forest is healthy if trees are free from insects and pathogens and growing at maximum rates; it is unhealthy if trees are dead or dying. Anything that decreases or threatens to decrease yield (insects, disease, decaying trees, fire) is something to be controlled or eliminated. Managers therefore argue for removal and commercial utilization of trees that are perceived to be in danger from such threats." "However, many conservationists and forest scientists have expressed concern about such thinking. This narrow definition of forest health does not consider the health of the entire ecosystem, such as water and soil quality and the diversity and interactions of other life forms. It does not provide guidance for management of resources other than timber. It has encouraged foresters to simplistically view insects and other non-timber elements of forest ecosystems as good or bad, based only on how they affect the growth rates of commercial tree species." "When viewing forests from an ecosystem health perspective, scientists do not recognize the 'forest health crisis' described by the proponents of salvage logging who are concerned about losing economically valuable timber to fire or insects. To the scientists, insects, disease and fire are normal parts of healthy ecosystems, essential for forest regeneration, cycling of nutrients and maintaining a variety of dead and living trees for wildlife habitat. Attempts to control or eliminate these agents may lead to unforeseen and undesirable consequences. For example, widespread removal of dead and dying trees eliminates habitat required by bird species that feed on insects that attack living trees, with the result that outbreaks of pests may increase in size or frequency (Torgersen et al. 1990)." http://www.magicalliance.org/Forests/Forest%20Health%20Evaluated.htm **Review: Not Relevant to the Project** *The link did not work. However, based on the quote provided, this paper is based on using salvage activities as a tool to reduce fire hazard and/or insect and disease epidemics to improve forest health. There is confusion as to which document "USFS 1993" is since no bibliography was included with this reference and there are many references available that could fit this citation. Current direction for National Forest Resource Management is in the Forest Service Manual (FSM) Chapter 2020.2: "The aim is to reestablish and retain ecological resilience of National Forest System lands and associated resources to achieve sustainable management and provide a broad range of ecosystem services. Healthy, resilient landscapes will have greater capacity to survive natural disturbances and large scale threats to sustainability, especially under changing and uncertain future environmental conditions, such as those driven by climate change and increasing human uses." Clarification on this point was not provided by the commentor, thus this review is based solely on the excerpt provided in the comment and does not take into account the reference "USFS 1993." The purpose and need of this project does not include any proposals to prevent decreases to yield, reduce fire hazard or losses to insects and disease, or to improve forest health or any proposed actions intended to meet such objectives.*
4	**Peterson, Mike. From testimony to the Senate Agriculture, Nutrition, and Forestry Committee concerning the Healthy Forests Restoration Act, HR 1904. June 26 2003.** "H.R 1904 does not include any specific measures to protect homes or communities. It is also inconsistent with the Western Governors' Association 10-Year Comprehensive Strategy, which does not call for any changes in existing laws. The only proven method to protect homes and

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	communities is to reduce flammable materials in the immediate vicinity of structures, yet the definitions in H.R. 1904 would not require any activities to be near homes. Instead, the bill seeks to further subsidize the timber industry and eliminate obstacles to logging large, fire-resistant trees miles away from the nearest home. The country's top forest scientists, including the Forest Service's own scientists, have found that this kind of logging can actually increase fire risk and make fires larger and more intense." http://agriculture.senate.gov/Hearings/testimony.cfm?id=824&wit_id=2258 **Review: Not Relevant to the Project** *Most of the quotation is unsupported opinion and is general and not specific to the Flint Foothills project. The Flint Foothills project is not a fuels project and is not designed to protect homes.*
4	**Platt, Rutherford V. Ph.D., Thomas T. Veblen Ph.D., and Rosemary L. Sherriff. "Are Wildfire Mitigation and Restoration of Historic Forest Structure Compatible? A Spatial Modeling Assessment" Published Online: by the by Association of American Geographers. Sep. 8, 2006.** "In response to catastrophic wildfires, wide-reaching forest management policies have been enacted in recent years, most notably the Healthy Forests Restoration Act of 2003. A key premise underlying these policies is that fire suppression has resulted in denser forests than were present historically in some western forest types. Therefore, although reducing the threat of wildfire is the primary goal, forest managers commonly view fuel treatments as a means to restore historic forest structure in those forest types that are outside of their historic range of variation. This study evaluates where both wildfire mitigation and restoration of historic forest structure are potentially needed in the ponderosa pine–dominated montane forest zone of Boulder County, Colorado. Two spatial models were overlain: a model of potential fireline intensity and a model of historic fire frequency. The overlay was then aggregated by land management classes. Contrary to current assumptions, results of this study indicate that both wildfire mitigation and restoration of historic forest structure are needed in only a small part of the study area, primarily at low elevations. Furthermore, little of this land is located on Forest Service land where most of the current thinning projects are taking place. We question the validity of thinning as a means both to reduce the threat of wildfire and to restore historic forest structure in the absence of site-specific data collection on past and present landscape conditions." http://www.ingentaconnect.com/content/routledg/anna/2006/00000096/00000003/art00001 **Review: Not Relevant to the Project** *The Flint Foothills is not a fuels project as indicated by the comment.*
4	**Potyondy, John P. 2007. "The Evolution of Channel Maintenance Science in the Forest Service"** Mr. Potyondy is the WO Watershed, Fish, Wildlife, Air, and Rare Plants Staff "Since that time, they have consulted with a wide array of scientists in the Forest Service, other agencies, universities, and consultants, with the aim of arriving at a consensus on the best science available to address this issue." http://www.stream.fs.fed.us/afsc/pdfs/Potyondy.pdf

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	Review: Not Relevant to the Project *This article is not peer reviewed and is not relevant because it describes channel maintenance flow determinations on Forest Service managed lands. This project did not involve any channel maintenance determinations.*
4	**Powell, Douglas S. Ph.D, Joanne L. Faulkner, David R. Darr, Zhiliang Zhu Ph.D. and Douglas W. MacCleery. 1992. "Forest Resources of the United States." USDA Forest Service. Rocky Mt. Forest and Range Experiment Station. Gen. Tech. Rep. RM-234.** "Private lands are more suitable for timber production. National Forest land is on average of lower productivity and on steeper, higher elevation terrain than are private forestlands." http://www.fs.fed.us/rm/pubs_rm/rm_gtr234.html **Review: Not Relevant to the Project** *This General Technical Report summarizes the forest resources in the United States in 1992. From the Introduction: "As required by the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), this report updates information on the Nation's forest resource, particularly the timber resource." This report is data compilation and summary and does not provide opinions or options for forest management. The specific citation is only partly accurate as quoted. The second sentence was found on page 8 of the reference as follows (emphasis added): "As a consequence, National Forest timberland is, on average, of lower productivity and on steeper, higher elevation terrain than are private timberlands." The first sentence was not found as quoted or in any form within the reference.*
1	**Powers, L. A. Dale, P. Gaede, C. Rodes, L. Nelson, J. Dean, and J. May. 1996. Nesting and food habits of the flammulated owl (Otus flammeolus) in southcentral Idaho. J. Raptor Research 30:15-20.** **http://elibrary.unm.edu/sora/jrr/v030n01/p00015-p00020.pdf** As related to letter 1 comment 35; additional literature to address **Review: Relevant to the Project** *The citation referenced is a peer-reviewed scientific paper concerning the food habits of flammulated owls in Idaho. Pertinent information contained in the paper is utilized in the Flint Foothills wildlife analysis.*
4	**Quigley, Thomas M. Ph.D., Richard W. Haynes and Russell Graham Tech. editors. 1996. "Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin and Portions of the Klamath and Great Basins." USDA Forest Service, PNW-GTR-382, 303 p.** "Fire severity has generally increased and fire frequency has generally decreased over the last 200 years. The primary causative factors behind fire regime changes are effective fire prevention and suppression strategies, selection and regeneration cutting, domestic livestock grazing, and the introduction of exotic plants." http://www.fs.fed.us/pnw/publications/icbemp.shtml

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	Review: Not Relevant to the Project *We agree there are many factors that have an effect on fire severity. This statement is not relevant to the Flint Foothills Project because the purpose and need doesn't address fuels or fire severity.*
4	**Raven, Peter, PhD, From his February 9, 2001 letter to Senator Jean Carnahan.** "The Act to Save America's Forests is based on the principles of conservation biology. It would make the protection native biodiversity the primary goal of federal forest management agencies. The bill would protect over 20 million acres of core forest areas throughout the nation, including ancient forests, roadless areas, key watershed, and other special areas. It is a comprehensive, sustainable, and ecologically-sound plan for protecting and restoring the entire federal forest system. If the current pace of logging planned by the Forest Service continues, nearly all of America's ancient and roadless wild forests will soon be lost forever. According to a recent report by the World Resources Institute, only one percent of the original forest cover remains in large blocks within the lower 48 states. The Act to Save America's Forests incorporates the solution recommended by the report, namely to protect core forest areas from any logging and to allow sustainable forest practices around these protected forests. Endorsed by over 600 leading scientists, this bill may be the last hope for America's forests." http://www.saveamericasforests.org/Raven.htm **Review: Not Relevant to the Project** *This was from a letter to Congress signed by over 600 scientists urging passage of the Act to Save America's Forests, not directly referencing the Flint Foothills Vegetation Management Project. They state that clearcutting and other even-aged silvicultural practices and timber road construction have caused widespread forest ecosystem fragmentation and degradation. This proposed legislation did not be become law. Thus, this article is not relevant to the site-specific Flint Foothills environmental analysis.*
4	**Raven, Peter, Ph.D., Jane Goodall, C.B.E., Ph.D., Edward O. Wilson, Ph. D. and over 600 other leading biologists, ecologists, foresters, and scientists from other forest specialties. From a 1998 letter to congress.** "Less than 5% of America's original forests remain, and these forests are found primarily on federal lands. Logging in the last core areas of biodiversity is destroying the remaining intact forest ecosystems in the United States. At the current rate of logging, these forests and their priceless biological assets will be destroyed within a few decades. We urge Congress to pass the Act to Save America's Forests. It is the first nationwide legislation that would halt and reverse deforestation on all our federal lands. By implementing protective measures based on principles of conservation biology, the bill provides a scientifically sound legislative solution for halting the rapid decline of our nation's forest ecosystems. The Act to Save America's Forests will: Make the preservation and restoration of native biodiversity the central mission of Federal forest management agencies.

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	Ban extractive logging in core areas of biodiversity and the last remnant original forest ecosystems: roadless areas, ancient forests and special areas of outstanding biological value. Protect sensitive riparian areas and watershed values by banning extractive logging in streamside buffer zones. End clearcutting and other even age logging practices on federal land. Establish a panel of scientists to provide guidance to federal forest management. We believe it is our professional responsibility to ask Congress to align Federal forest management with modern scientific understandings of forest ecosystems. Passage of the Act to Save America's Forests will give our nation's precious forest ecosystems the best chance or survival and recovery into the 21st century and beyond." http://www.saveamericasforests.org/resources/Scientists.htm **Review: Not Relevant to the Project** *This citation is from a letter that supported the 2001 proposed Act to Save America's Forests Legislation. According to the letter, the Act would have ended logging in all the remaining Northwest Ancient Forests, ended logging in all remaining roadless forests, and ended logging in "special" forest areas throughout the federal forest system, such as the giant Sequoia forests in California. In addition, the Act would have banned clearcutting in the national forests. The proposed legislation did not become law. Thus, this article is not relevant to the Flint Foothills Vegetation Management Project.*
4	**Reed, R.A., Johnson-Barnard, J., and Baker, W.A. 1996. "Contribution of Roads to Forest Fragmentation in the Rocky Mountains." Conservation Biology 10: 1098-1106.** "Increasingly, previously extensive, continuous tracts of forest are being reduced to widely dispersed patches of remnant forest vegetation by logging and road-building, but few measures of the effects of roads on forest fragmentation are available. Fragmentation affects animal populations in a variety of ways, including decreased species diversity and lower densities of some animal species in the resulting smaller patches. This study seeks to quantify the effects of roads and logging activities on forest habitat." "Roads precipitate fragmentation by dissecting previously large patches into smaller ones, and in so doing they create edge habitat in patches along both sides of the road, potentially at the expense of interior habitat. As the density of roads in landscapes increases, these effects increase as well. McGurk and Fong (1995) considered the additive effects of clearcuts and roads, but did not measure the amount of associated edge habitat. Thus a more direct measurement of the impacts of roads on landscapes is needed." http://cpluhna.nau.edu/Research/contribution_of_roads_to_forest_.htm **Review: Relevant to the Project** *Information is included in the Flint Foothills wildlife analysis that addresses potential effects of existing and temporary roads on wildlife and/or habitat (see analyses for grizzly bear, wolverine, and elk).*

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4	**Reice, Seth, Ph.D. 1998. Statement. Press conference with Senator Robert Torricelli, April 28, 1998.** "Disturbances, from windthrown trees to fires, are natural in forests and are essential for forest ecosystem well being. For example, fire is a disturbance in forests, but it is also beneficial. While disturbances kill some individuals, they also open up ecological living space for recolonization by many previously excluded species." "Without fire, natural succession is upset. In a forest where fire has been unnaturally suppressed for many years (50 or more), fire intolerant trees grow unchecked, suppressing and outcompeting the normally dominant fire resistant trees. Overall biodiversity is reduced. As the tree diversity declines, the habitat becomes unsuitable for a large portion of the forest species. Animal species are lost, since the animals use the fire tolerant variety of tree species for food, shelter and nest sites." http://www.saveamericasforests.org/news/ScientistsStatement.htm **Review: Not Relevant to the Project** *The paper referenced is a compilation of statements in support of a bill before Congress in 1998. The quote above speaks to natural disturbances in forests, and more specifically that without fire, natural succession is upset. The analysis for this project speaks to the same processes – natural disturbances, including fire – and the effects of removing those disturbances over the past 100 years within the project area. However, the paper referenced is more focused on the idea of saving America's Forests, in support of the proposed Congressional bill, and does not have relevance to this project. The document consists of statements from six scientists supporting the passage of the Act to Save America's Forests. This proposed legislation did not be become law. Thus, this article is not relevant to the site-specific Flint Foothills environmental analysis.*
4	**Reid, L. M. Ph.D. and T. Dunne (1984), "Sediment Production from Forest Road Surfaces" Water Resour. Res., 20(11), 1753–1761** "Erosion on roads is an important source of fine-grained sediment in streams draining logged basins of the Pacific Northwest. Runoff rates and sediment concentrations from 10 road segments subject to a variety of traffic levels were monitored to produce sediment rating curves and unit hydrographs for different use levels and types of surfaces. These relationships are combined with a continuous rainfall record to calculate mean annual sediment yields from road segments of each use level. A heavily used road segment in the field area contributes 130 times as much sediment as an abandoned road. A paved road segment, along which cut slopes and ditches are the only sources of sediment, yields less than 1% as much sediment as a heavily used road with a gravel surface." http://www.agu.org/pubs/crossref/1984/WR020i011p01753.shtml **Review: Relevant to the Project** *This peer-reviewed journal article looks at some of the effects of road types and use levels on turbidity and sedimentation. Heavily used roads can contribute significant amounts of sediment compared to lightly used roads of the same type. For this project, most roads are native or gravel surface roads, and roads used for the project will receive heavy use at times. However, BMPs that have been demonstrated to be effective at controlling sediment and road maintenance will be used to minimize sedimentation from all project roads. Model results and monitoring have shown that significant reductions in sedimentation would occur from road maintenance and applying BMPs to roads, even for roads that are more heavily used.*

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4	**Reid, Leslie M. Ph.D., Robert R. Ziemer Ph.D., and Michael J. Furniss. 1994. "What do we know about Roads?" USDA Forest Service.** "Roads are associated with high sediment inputs and altered hydrology, both of which can strongly influence downstream channel habitats. Roads are also important as a source of indirect human impacts and as an agent of vegetation change and wildlife disturbance." "Any ground disturbance increases the potential for erosion and hydrologic change, and roads are a major source of ground disturbance in wildlands. Compacted road surfaces generate overland flow, and much of this flow often enters the channel system, locally increasing peak flows. Localized peak flows are also increased where roads divert flow from one swale into another, and where roadcuts intercept subsurface flows." "Overland flow from the road surface is a very effective transport medium for the abundant fine sediments that usually are generated on road surfaces. Road drainage also can excavate gullies and cause landslides downslope in swales. Cut and fill slopes are often susceptible to landsliding, and road-related landsliding is the most visible forestry-related erosional impact in many areas." http://www.fs.fed.us/psw/publications/reid/4Roads.htm **Review: Relevant to the Project** *This government workshop note mentions some of the effects of roads on hydrology, turbidity and sedimentation. This article addresses questions regarding which roads need to be maintained, which roads need controlled access, and which roads should be obliterated. It identifies the types of information needed to make these critical decisions. Since this project is not a transportation planning project only some of the information in this article applies to this project.*
4	**Rice, Raymond M. Ph.D., Forest B. Tilley and Patricia A. Datzman.1979. "Watershed's Response to Logging and Roads: South Fork of Caspar Creek, California, 1967-1976." USDA Forest Service, Research Paper PSW-146.** "Disturbances from roadbuilding and logging changed the sediment/discharge relationship of the South Fork from one which was supply dependent to one which was stream power dependent, resulting in substantial increases in suspended sediment discharges." "Road construction and logging appear to have resulted in increases in average turbidity levels (as inferred from suspended sediment increases) above those permitted by Regional Water Quality Regulations." http://www.fs.fed.us/psw/publications/rice/Rice79.pdf **Review: Relevant to the Project** *This peer-reviewed government report looks at some of the effects of forest harvest and roads on hydrology, turbidity and sedimentation in Northern California. The South Fork watershed produced a total of 4,787 cubic yards/square mile excess sediment during the 5 years after logging was started. This sediment represents nearly a threefold increase over that which would have been expected had the watershed remained undisturbed.* *This study was done before forest practice rules were implemented in California, and before the Forest Service had begun to use BMPs to control non-point sources of sediment. Because the Flint Foothill project will use BMPs to reduce sediment, sediment amounts generated from forest harvest and roads will be significantly less than the amounts observed in this study.*

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4	**Riedel, Mark S. Ph.D. and James M. Vose Ph.D., "Forest Road Erosion, Sediment Transport and Model Validation in the Southern Appalachians." Presented at the Second Federal Interagency Hydrologic Modeling Conference, July 28 – August 1, 2002.** "Sediment eroded from gravel roads can be a major component of the sediment budget in streams in this region (Van Lear, et al, 1995)." http://www.srs.fs.usda.gov/pubs/ja/ja_riedel002.pdf **Review: Not Relevant to the Project** *This peer-reviewed government report is not relevant to the project because it looks at a sediment model used in the Appalachians. The Sediment Tool is a spatially explicit, GIS based, finite element, lumped parameter model which generates estimates of soil erosion, sediment routing and sediment yield from forest roads. Instead, the WEPP Roads model was used for this project because it looks at site-specific road erosion.*
4	**Roberson, Emily B. Ph.D., Senior Policy Analyst, California Native Plant Society. 2002. Excerpt from a letter to Chief Dale Bosworth and 5 members of congress.** "It is well established that logging and roadbuilding often increase both fuel loading and fire risk. For example, the Sierra Nevada Ecosystem Project (SNEP) Science Team (1996) concluded that "timber harvest…. Has increased fire severity more than any other recent human activity" in the Sierra Nevada. Timber harvest may increase fire hazard by drying of microclimate associated with canopy opening and with roads, by increases in fuel loading by generation of activity fuels, by increases in ignition sources associated with machinery and roads, by changes in species composition due to opening of stands, by the spread of highly flammable nonnative weeds, insects and disease, and by decreases in forest health associated with damage to soil and residual trees (DellaSala and Frost, 2001; Graham et al., 2001; Weatherspoon et al. 1992; SNEP Science Team 1996). Indeed a recent literature review reported that some studies have found a positive correlation between the occurrence of past logging and present fire hazard in some forest types in the Interior Columbia Basin (DellaSala and Frost 2001)." http://www.plantsocieties.org/PDFs/Fire%20letter%20CNPS%208.02%20letterhead.pdf **Review: Not Relevant to the Project** *Surface wind may increase and surface fuels may be drier as a result of thinning from below, but this technique has the effect of requiring longer flame lengths to begin torching and make independent crown fire less probable (Graham et al. 2004). Slash treatments would occur post-harvest on timber units through pile burning at landings, alleviating the concern of residual post-treatment activity slash. The more open stands created through treatment and slash disposal offer firefighters the type of stand conditions that enable safer direct attack opportunities than the pre-treatment. Additionally, the resulting, more open stand conditions (Fuel model 2) have the added benefits of having live fuel associated with the fuel model and lower moisture of extinction, when compared to the current closed timber, moderate or heavy down fuels (Fuel model 8/10). The live fuel has a dampening effect of fire behavior as moisture present absorbs heat and has to be driven off. This can be seen when approaching fires burn into green grass near homes. Moisture of extinction in dead fuels is defined as the upper limits of fuel moisture beyond which a fire will no longer spread with a uniform front (Albini 1976, Anderson 1982). Closed timber fuel models have a moisture of extinction of 30, compared to open timber fuel models which have a moisture of extinction of 15. This results in the open fuel models reaction much faster to environmental change: for example*

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	changes in Dewpoint and Relative Humidity.
1	**Roberts, T. 1990. Cheatgrass: management implications in the 90's.Pages 19-21 in Proceedings – Symposium on cheatgrass invasion, shrub die-off and other aspects of shrub biology and management. USDA Forest Service. Intermountain Research Station. General Technical Report INT-276.** **Review: Relevant to the project** See previous response on this citation.
4	**Robertson F. Dale. From a June 4, 1992 letter to Regional Foresters and Station Directors, Appendix B** "We have made great progress under New Perspectives to get land managers and scientists working together as a team in doing the best job possible. Let's keep it up and make sure our decisions reflect the best science and close the gap between the level of scientific knowledge and its application in our day-to-day management." http://www.fs.fed.us/r1/wmpz/documents/existing-forest-plans/lolo_5_yr_review.pdf **Review: Relevant or Not Relevant to the Project** *This excerpt is from a memo from Chief Robertson outlining his new policy on ecosystem management. A land manager/scientist partnership was one of three point stated that were needed to make ecosystem management successful. The need to utilize the best science is not new; agency decisions have always required a sound scientific basis, per 40 CFR, 1502.24. The Forest Service is currently working under the transition provision of the 1982 planning rule. Under these regulations, the Forest Service is required to consider the "best available science" when implementing site-specific projects within a forest plan. 36 C.F.R. § 219.35(a) (2001). The Flint Foothills Vegetation Management Project considers the latest and best science available—over 100 references are cited in the analyses.*
4	**Roelofs, Terry D. Ph.D. Testimony for the California State Water Board and Regional Water Quality Control Boards Regarding Waivers of Waste Discharge Requirements on Timber Harvest Plans. August 2003.** "I will discuss my views on how activities related to timber harvest adversely affect coastal salmonids in California by destroying, altering, or otherwise disturbing the freshwater habitats upon which these fish depend during crucial phases of their life cycle. I base these opinions on my research and observations in the field, as well as my review of and familiarity with the scientific literature and publications of government agencies, commissions, and scientific review panels. Below I discuss in some detail the life history and habitat needs of coho salmon to illustrate how timber harvest and related roads affect this threatened species. Although Chinook salmon and steelhead trout have similar life histories and habitat needs, and also are negatively affected by timber harvest, I will use coho salmon in my discussion." "Loss or degradation of stream habitat has been and remains the single most significant cause of the decline of anadromous salmonids in general in the Pacific Northwest. In my experience the most pervasive and severe impacts to coastal watersheds in California inhabited by coho salmon result from logging and associated activities. These activities cause significant alteration and degradation to coho salmon habitat by 1) increasing

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	sediment input to salmon bearing streams and their tributaries: 4) by decreasing input of LWD into waterways; 3) by altering streamflow regimes, increasing the likelihood of scouring flows and flooding; and 4) by increasing water temperatures. These pervasive changes due to timber harvest decrease the complexity and suitability of coho salmon habitat, including adversely affecting insects and other organisms that provide food for fish." http://www.docstoc.com/docs/20957789/ EXPERT-WITNESS-REPORT-OF-TERRY-D **Review: Not Relevant to the Project** This paper discusses how logging and associated activities impact coastal watersheds in California and Coho salmon. RCA buffers and BMPs would be used in the Flint Foothills project to protect streams from sedimentation and temperature increases.
1	**Romme, William H. 1982**. "**Fire and Landscape Diversity in Subalpine Forests of Yellowstone National Park Fire and Landscape Diversity in Subalpine Forests of Yellowstone National Park**." **Ecological Monographs, Vol. 52, No. 2 (Jun., 1982), pp. 199-221** "For example, the last 70 to 80 years of fire suppression have not had much influence on subalpine landscapes with fire intervals of 200 to several hundred years (Romme and Despain)." **Review: Not Relevant to the Project** *We agree that fire suppression has had less influence on subalpine landscapes than on lower elevation forest landscapes.*
1	**Romme, William H.; Despain, Don G. 1989. Historical perspective on the Yellowstone fires of 1988. Bioscience. 39(10): 695–699.** **http://www.jstor.org/stable/1311000?origin=crossref** **Review: Relevant or Not Relevant to the Project** Unable to answer at this time; cannot locate the document
4	**Romme, W.H., J. Clement, J. Hicke, D. Kulakowski Ph.D. L.H. MacDonald, T.L. Schoennagel Ph.D., and T.T. Veblen. 2006 "Recent Forest Insect Outbreaks and Fire Risk in Colorado Forests: A Brief Synthesis of Relevant Research."** "Although it may be relatively easy to ascertain whether an individual tree is healthy or not, the concept of "forest health" is very ambiguous. The presence of unhealthy trees does not necessarily imply that the forest as a whole is unhealthy. On the contrary, standing dead trees and fallen logs (coarse wood) play important roles in wildlife habitat, soil development, and nutrient cycling, and are a defining characteristic of old-growth forests. Bark beetle outbreaks rarely kill all of the trees in a stand, because they preferentially attack the larger trees and generally ignore the smaller trees. These smaller trees may be hidden by the red needles of the large killed trees during the peak of the outbreak, such that one often has an impression of total tree mortality. However, once those needles fall it usually becomes apparent that many small and moderate sized trees survived the outbreak. These smaller trees may grow two to four times more rapidly after the outbreak than they did before, because they are no longer competing with the big trees for light, water, and nutrients (Romme et al. 1986). In mixed forests of lodgepole pine and aspen, the aspen may grow more vigorously after beetles kill the dominant pine trees. Even when all of the trees are killed, as in a severe forest fire, the result usually is stand

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	regeneration, as described above for lodgepole pine. Thus, from a purely ecological standpoint, dead and dying trees do not necessarily represent poor "forest health." They may instead reflect a natural process of forest renewal." (pg.11) http://www.cfri.colostate.edu/docs/cfri_insect.pdf **Review: Not Relevant to the Project** *The link provided did not access the referenced paper. However, reading the excerpts provided, there is no use of the phrase 'forest health' in the analysis. In addition, with the current epidemic, the norms of mortality seen on the Forest are outside of the published literature, with 100 percent of lodgepole pine stands and down to 5 inches in diameter sized trees within the stands affected by the mountain pine beetle.*
4	**Rowland, M. M., M. J. Wisdom, B. K. Johnson, and M. A. Penninger. 2005. "Effects of Roads on Elk: Implications for Management in Forested Ecosystems." Pages 42-52 in Wisdom, M. J., technical editor, The Starkey Project: a synthesis of long-term studies of elk and mule deer. Reprinted from the 2004 Transactions of the North American Wildlife and Natural Resources Conference, Alliance Communications Group.** "Early studies of elk were among the first to address effects of roads on wildlife, establishing a precedent for subsequent research on a wide range of terrestrial and aquatic species. These early elk-roads studies included those reported in a symposium on the topic in 1975 (Hieb 1976), the seminal studies of Jack Lyon in Montana and northern Idaho (Lyon 1979, 1983, 1984), the Montana Cooperative Elk-Logging Study (Lyon et al. 1985), and work by Perry and Overly (1977) in Washington and Rost and Bailey (1979) in Colorado. As research and analysis techniques have become more sophisticated, particularly with the advent of geographic information systems (GIS) and high-resolution remote imagery, the study of effects of roads on terrestrial and aquatic communities has evolved into a unique discipline of "road ecology" (Forman et al. 2003). Road effects are far more pervasive than originally believed and include such disparate consequences as population and habitat fragmentation, accelerated rates of soil erosion, and invasion of exotic plants along roadways. Indeed, "in public wildlands management, road systems are the largest human investment and the feature most damaging to the environment" (Gucinski et al. 2001:7). Summaries of the effects of roads on wildlife habitats and biological systems in general have been compiled by Forman and Alexander (1998), Trombulak and Frissell (2000), Gucinski et al. (2001), Forman et al. (2003) and Gaines et al. (2003)." http://www.fs.fed.us/pnw/pubs/journals/pnw_2004_rowland001.pdf **Review: Relevant to the Project** *It is recognized that lower-standard, unpaved Forest roads have potential effects. The effects of displacement and avoidance were addressed in the Forest Plan and provides wildlife secure habitat through management of open motorized road and trail densities. This direction is discussed in the Flint Foothills wildlife analysis, more specifically as it pertains to grizzly bears, wolverines and elk.*
4	**Rudzitis, Gundars. 1999 "Amenities Increasingly Draw People to the Rural West." Rural Development Perspectives, vol. 14, no. 2.** "People moving to the region may do so for reasons related to the social environment and the physical landscape but not care about specific Federal land management practices. We found this not to be true, since 92 percent were concerned with how Federal lands were managed. The

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	most frequent preferences for managing Federal lands were water/watershed and ecosystem protection (table 3). Timber harvesting was cited by 16 percent, grazing and ranching by 6 percent, and mineral exploration/mining by less than 1 percent. Overall, protective strategies made up 76 percent of the preferred management strategies and commodity-based strategies 23 percent. This same trend is evident for the second and third most stated preferences. These findings also contradict the longstanding view of the Federal lands as a public warehouse of commodities to be harvested and jobs to be filled. For newcomers in the rural West, the value of these public lands is related to protecting and preserving them." http://www.ers.usda.gov/publications/rdp/rdpsept99/rdpsept99b.pdf **Review: Relevant to the Project** *This article shows surveys offering some support for the purpose and need from residents of the Interior Columbia Basin.*
1	**Ruggerio et al. 1994. Viability Analysis in Biological Evaluations: Concepts of Population Viability Analysis, Biological Population, and Ecological Scale. Rocky Mountain Forest and Range Experiment Station. Laramie, Wyoming.** "Considering potential difficulties of using population viability analysis at the project analysis area level (Ruggiero, et. Al., 1994)" http://maps.wildrockies.org/ecosystem_defense/Science_Documents/Ruggerio_et_al_1994.pdf **Review: Relevant to the Project** *The citation consists of peer-reviewed scientific literature exploring a methodology for assessing species viability. Species viability analysis was conducted at the Forest scale as part of the Forest Plan Revision process. However, concepts described in the paper that include forest structure composition, connectivity of habitat,, and species' life history traits are incorporated into the Flint Foothills wildlife analysis where appropriate to help identify effects to species.*
4	**Schneider, Gary "Dead trees (they're still full of life!)" 2008. Macphail Woods Ecological Forestry Project.** "More and more woodlot owners are taking a broader view of their forests. They look for values other than the immediate return on wood harvested. These values include other forest products such as ground hemlock and mushrooms; carbon storage; water purification; leaving a legacy for their children; and healthy wildlife populations. Wildlife trees (dead or dying trees used for nesting, feeding, denning and roosting) go through several stages that can start with ants tunneling into the rotting centre to flycatchers perching on the bare branches. For cavity-nesting birds they are critical habitat. Some species excavate cavities for their nests, while others take over and enlarge existing holes. Many of these birds in turn help the forest, eating insects which can damage trees." http://www.macphailwoods.org/wildlife/deadtrees.html **Review: Not Relevant to the Project** *The reference consists of a webpage summary of the ecological benefits of snags to wildlife species occurring on Prince Edward Island, Canada.*

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	The contents of the bulletin have little applicability to the wildlife analysis conducted for the Flint Foothills Project due to a lack of cited science sources, lack of species-specific information, and differences in habitats associated with Prince Edward Island.
4	**Schowalter, Tim Ph.D., "Insect epidemics a natural path to forest health?" 27-May-1997, *OSU News*.** "Research has already shown that insects are a key in cycling nutrients, speeding decomposition and building soil fertility. It now appears they do far more than that. It's becoming clear that major insect attacks are a powerful tool to shape the very species and structure of forests into one that's appropriate for the terrain and climate – and one that's sustainable. In Oregon we've viewed the major insect epidemics simply as disasters. In fact, those destructive outbreaks are having an effect that's roughly comparable to fire. In some ways they're doing the forest underthinning that fire would have done and we should have done." Defoliating and sap-sucking insects affect nutrient turnover. Wood boring insects penetrate bark and provide access for decomposers and water, accelerating decomposition. Outbreaks can open holes in the forest canopy. The surviving trees get a nutrient burst to improve their growth and health. Something has to establish a balance between the available water, nutrients and the demands of plants. We finally came to realize that fire was a big part of that. Now we need to change our view of insects, because they too play a major role." http://oregonstate.edu/dept/ncs/newsarch/1997/May97/goodbugs.htm **Review: Not Relevant to the Project** *The link provided did not access the referenced paper. However, reading the excerpts provided, this project does not view the insect epidemic and/or endemic populations as a disaster.*
4	**Schwartz, Chuck Ph.D. – March 1998. "Wildlife and Roads" The Interagency Forest Ecology Study Team (INFEST) newsletter.** "The consequences of road construction to wildlife are generally negative. Roads result in increased human access, habitat fragmentation, disturbance, and in some cases direct mortality due to vehicle collisions." "Research has documented an 80% decline in grizzly bear habitat use within 1 km of open roads used by motorized vehicles in Montana9. This has been ascribed either to bears avoiding humans or to the selective over-harvest of bears habituated to humans that would otherwise more fully use areas heavily influenced by people." http://www.sf.adfg.state.ak.us/sarr/forestecology/fsroads.cfm **Review: Relevant to the Project** *Relevant to this project. Roads (and motorized trails) have been recognized to affect wildlife use in an area. As a result, the Forest Plan includes goals, objectives and standards to provide wildlife secure areas.*

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4	**Science Blog. 2001. David Stauth and Tim Showalter.** **Review: Not Relevant to the Project** *The reference appears to be a press release from Oregon State University about a report that could not be found, rather than a scientifically relevant document. From press release, the discussion focuses on Pacific Northwest forests, and speaks to the benefits of insects to thinning forests, with one statement saying "insects are usually helpful to the forest and rarely cause large epidemics". The current mountain pine beetle epidemic is not thinning the forests, rather is affecting 100 percent cent of the 5 inch and larger lodgepole pine stands over the project area (refer to the EA, Vegetation analysis). At endemic levels, the insect activity acts as the article indicates – the project area is part of a larger epidemic of mountain pine beetle.*
4	**Science Buzz. 2007. "Rising from the ashes: Forest fires give way to new growth" May.** (supported by the National Science Foundation) "As a rule of thumb, timber experts say that any particular chunk of ground in the forest should be touched by intense fire every 50 to 100 years. But the power of the fire is just the first step in forest regrowth. Weather patterns in the affected area over the nest year will play a big role in how the new forests develop. A summer of drought could kill the newly released seeds and short-circuit any new growth. That could give new species of trees a chance to grow in the area. Normal rains mixed with the nutrients left on the ground from the fire could be a great booster shot to getting the seeds off to a flying start. Other natural benefits can be seen from fires. For instance, the once-rare black-backed woodpecker is now a regular site in the BWCA with the abundance of dead trees from recent smaller fires and the 1999 wind blow down of trees. New shrubs and ground vegetation is appealing to different kinds of wildlife to snack on." http://www.sciencebuzz.org/blog/rising_from_the_ashes_forest_fires_give_way_to_new_growth **Review: Not Relevant to the Project** *The link is to a blog about post-fire effects on the Superior National Forest in Minnesota. This project takes place in southwestern Montana, and does not propose any activities in post-fire affected areas.*
4	**Shahid Naeem, Chair, F.S. Chapin III, Robert Costanza, Paul R. Ehrlich, Frank B. Golley, David U. Hooper, J.H. Lawton, Robert V. O'Neill, Harold A. Mooney, Osvaldo E. Sala, Amy J. Symstad, and David Tilman. 1999. "Biodiversity and Ecosystem Functioning: Maintaining Natural Life Support Processes." Ecological Society of America, Issues in Ecology, Issue 4.** **Review: Relevant to the Project** *The article referenced explores the link between biodiversity and ecosystem function, and the fact that much more research needs to be done. Loss of species is detrimental to ecosystem function, though research to date has not identified predictive impacts or effects of losing any particular*

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	species on ecosystem process. The project analysis recognizes ecosystem process with natural disturbance regimes that operate within the analysis area, and the potential loss of species such as ponderosa pine and whitebark pine in the absence of the effects of naturally occurring fires; the potential loss of these two species can be contributed to the current MPB epidemic, coupled with increased stand densities of fir species with the absence of fire over the past century, and additionally with whitebark pine, the effects of white pine blister rust.
4	**Shanley, James B. and BeverleyWemple Ph.D. "Water Quantity and Quality in the Mountain Environment" Vermont Law Review, Vol. 26:717, 2002** "The effects of forest roads on hydrology are related to the effects of forest clearing. Most logging requires road access, and the roads often remain after the logging, so there are both short and long-term effects.94 Forest road surfaces are relatively impermeable. Water readily runs over the road surface and associated roadside ditches, often directly to a stream channel, with the net effect of extending channel networks and increasing drainage density.95 In addition to providing conduits for overland flow, forest roads involve slope-cuts and ditching that may intersect the water table and interrupt natural subsurface water movement.96 This diversion of subsurface water may be quantitatively more important than the overland flow of storm water in some watersheds.97 The importance of roads in altering basin hydrology has been underscored in paired-watershed studies and recent modeling studies.98 " (Pgs. 730 and 731) http://www.uvm.edu/~bwemple/pubs/shanley_wemple_law.pdf **Review: Relevant to the Project** *This peer-reviewed journal article looks at water quality and quantity in northeastern USA mountain environments. It is not a study, but a literature review. The mountain stream is an integrator of processes and activities occurring within the stream's watershed. This means that the condition of the stream at a given point reflects the net effects of all activities upstream. A stream reach may be degraded as a result of disturbance upstream even when the adjacent watershed is healthy. Too much disturbance in the watershed of a stream can destabilize the stream. The concepts outlined in this article apply to the Flint Foothills project.*
4	**Short, Brant, Ph.D. and Dayle C. Hardy-Short Ph.D. "Physicians of the Forest": A Rhetorical Critique of the Bush Healthy Forest Initiative" Electronic Green Journal, Issue #19, December 2003.** "Within this volatile atmosphere the Bush Administration presented a new proposal for fire prevention called the "Healthy Forest Initiative." The plan received wide coverage in the national media in August and September 2002 and continues to be at the center of an attempt to significantly shift public land management in the United States. At the core of the plan is an effort to create private sector incentives to promote logging/thinning projects in the national forests." http://escholarship.org/uc/item/4288f8j5 **Review: Not Relevant to the Project** *Not relevant to this project because this is an opinion piece, not a peer reviewed research paper.*

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4	**Sierra Club. 2005. "Ending Commercial Logging on Public Lands"** "Logging on the National Forests provides less than 5% of the nation's timber supply, but costs the taxpayers more than 1 billion dollars in subsidies every year. Nor is logging a good job provider compared to recreation, which by Forest Service estimates provides over 30 times the economic benefits of logging. These forests are the last remnants of the virgin forests that covered the country, and now have far more value as forest ecosystems, watershed/water supply protection, and recreational assets than for logging. In fact, the justification for the Weeks Act in 1911 which established national forests in the east, was watershed protection. (A major barrier to the Forest Service changing its ways is that these increased recreational economic benefits flow into the local economy, not to the Forest Service itself, whereas extractive uses of the national forests contribute directly to Forest Service budgets.) "Our nation is engaged in a great debate over the real purpose of our national forests, with the weight of public opinion swinging more and more strongly toward preservation. Certainly this nation should not be subsidizing logging when it is clear that we understand so little about the functioning of these enormously complex and ancient forest ecosystems that provide millions of people with clean air and water, as well as homes for a myriad of plants and wildlife that can live nowhere else." http://northcarolina.sierraclub.org/pisgah/conservation/ecl.html **Review: Not Relevant to the Project** *This is a perspective piece. It is not relevant to the project.*
4	**Smith, Jane Kapler, ed. "Wildland Fire in Ecosystems: Effects of Fire on Fauna" USDA Forest Service Rocky Mountain Research Station. General Technical Report RMRS-GTR-42-volume 1. January 2000.** "Species that breed exclusively in the first 30 years after fire may be difficult to maintain in the ecosystem without fire. Fire exclusion and post-fire salvage of dead trees after fire may reduce populations of these species over large geographic areas." http://nps.gov/fire/download/fir_eco_wildlandfireJan2000.pdf **Review: Relevant to the Project** *The reference consists of a peer-reviewed science paper that reviews the effects of fire on wildlife. Portions of the paper would be useful in supporting analysis of effects to species as a result of prescribed fire treatments proposed under the Flint Foothills Project.*
4	**Smith, Ted. 1996. "Chief's Ecosystem Stewardship Conference Workshop Review" Eco-Watch, February 26, 1996** "In 1994 Chief Jack Ward Thomas of the U.S. Forest Service invited private foundations to join the USFS and other federal resource management agencies in co-funding a national workshop designed to bring the best science, broadly defined, to an 11-day workshop of agency natural resource managers.1 Having a science background himself, Thomas wanted to capture the scientific underpinnings of ecosystem dynamics in order to establish a more solid basis for sustainable resource management. Private foundations, invited for the first time to join the Forest Service in this way, would, Thomas felt, add legitimacy and assist in bringing in scientific talent from outside the government."

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	http://www.fs.fed.us/eco/eco-watch/ew960226.htm **Review: Not Relevant to the Project** *This excerpt is from a commentary on the 11-day workshop the author participated in that was hosted by then Chief Thomas. The group tackled integrating scientific knowledge into "managing the resource base for a public that is distinguished mainly for giving mixed signals." The article has no direct relevancy to the Flint Foothills Vegetation Management Project, though illustrates the complexity of managing natural resources.*
4	**Stahl, Andy. "Reducing the Threat of Catastrophic Wildfire to Central Oregon Communities and the Surrounding Environment." Testimony before the House Committee on Resources, August 25, 2003** "In sum, 100 years of fire suppression and logging have created conditions that threaten central Oregon's natural resources and communities." "Thus it is inexplicable that the solution proposed by President Bush and some members of Congress emphasizes fire suppression and commercial logging, the very practices that created today's crisis. The federal government continues to attempt to suppress over 99% of all wildland fires. The Forest Service continues to measure its success not in terms of ecosystems restored, but in fires put out. The President's Healthy Forest Initiative, as embodied in H.R. 1904, promotes commercial logging at the expense of citizen participation and oversight of the forests we own." http://www.fseee.org/stay-informed/our-online-library/congressionaltestimony/44-reducing-the-threat-of-catastrophic-wildfire-to-central-oregon-communities-and-the-surrounding-environment **Review: Not Relevant to the Project** *This is an opinion piece, not a peer reviewed research paper.*
1	**Squires, J. and L. Ruggiero. 1995. Winter movements of adult northern goshawks that nested in southcentral Wyoming. J. Raptor Research 29:5-9.** **http://elibrary.unm.edu/sora/jrr/v029n01/p00005-p00009.pdf** as related to letter 1, comment 35; additional literature to address **Review: Relevant to the Project** *This peer-reviewed science paper documents northern goshawk winter movements and habitat use in southern Wyoming, the results of which are included in the Flint Foothills wildlife analysis.*
4	**Strickler, Karyn and Timothy G. Hermach, "Liar, Liar, Forests on Fire: Why Forest Management Exacerbates Loss of Lives and Property" Published by CommonDreams.org, October 31, 2003.** "Fire, just like insects and disease, are a natural and beneficial part of forest ecosystems and watersheds. Without these natural processes the forest ecosystems quickly degrade. Excessive logging removes and reduces cooling shade adding to the hotter, drier forests along with logging debris creating a more flammable forest. Current "forest management" practices, road building and development cause forest fires to rage for

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	hundreds of miles. The Sierra Nevada Ecosystem Project said in a report to the U.S. Congress that timber harvests have increased fire severity more than any other recent human activity. Logging, especially clear cutting, can change the fire climate so that fires start more easily, spread faster, further, and burn hotter causing much more devastation than a fire ignited and burned under natural conditions. If we stop the logging and stop building fire prone developments, we minimize the loss of lives and property suffered by people in fires. As long as the people of America let politicians, timber executives, and the Forest Service get away with it – it will not stop. Those corporations that profit will continue to lie, cheat and steal to continue to make more money from our losses. Just like big tobacco." http://www.commondreams.org/scriptfiles/views03/1031-10.htm **Review: Not Relevant to the Project** *This is an opinion piece, not a peer reviewed research paper.*
4	**Swift Jr., L. W. "Soil losses from roadbeds and cut and fill slopes in the Southern Appalachian Mountains." Southern Journal of Applied Forestry 8: 209-216. 1984.** "Roads are often the major source of soil erosion from forested lands (Patric 1976)." "Generally, soil loss is greatest during and immediately after construction." http://cwt33.ecology.uga.edu/publications/403.pdf **Review: Relevant to the Project** *This peer-reviewed journal article looks at some of the effects of roads on soil losses and erosion, and suggests mitigations to avoid soil loss. This study shows that the cut and fill slopes of roads are a significant sediment source that can be reduced by early establishment of vegetation or by BMPs to control storm flows. Also, gravel surfacing was found to be effective at reducing sediment. BMPs will be used in this project that are designed to reduce sediment from roads, and these can be found in the project hydrology report or in the DEIS.*
4	**Switalski, Adam. "Where Have All the Songbirds Gone? Roads, Fragmentation, and the Decline of Neotropical Migratory Songbirds" Wildlands CPR, September 8, 2003.** "More subtle causes of habitat loss include the construction of roads and power lines. These linear barriers also have been correlated with a decline in neotropical migrant songbirds (Berkey 1993; Boren et al. 1999; Ortega and Capen 2002). Whether by forest conversion or the construction of roads and power lines, fragmentation subdivides habitat into smaller and smaller parcels. The result is an increase of edge habitat, or the boundary between intact forest and surrounding impacted areas. Small forests with large amounts of edge habitat are a hostile landscape for nesting neotropical migratory songbirds. In these areas, songbirds face two great threats: 1) the loss of eggs and nestlings to predators and, 4) parasitism by cowbirds." http://www.wildlandscpr.org/node/213

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	Review: Relevant to the Project *This paper summarizes results from select published articles. The paragraph quoted above deals with forest conversion, roads and powerlines and effects of fragmentation. See response to Al-jabber (2003) reference.*
4	**Tanner, G.W. Ph.D., W.R. Marion Ph.D., and J.J. Mullahey Ph.D. "Understanding Fire: Nature's Land Management Tool" A Florida Cooperative Extension Service publication, July, 1991.** "Ecological benefits of fire: Promotes flowering of herbaceous species and fruit production of woody species. Improves nutritional quality of plants for both wild and domestic animals. Enhances nutrient cycling of some elements and elevates soil pH. Maintains required habitat conditions for fire-adapted plant and animal species. Results in a more heterogenous and diverse habitat–if natural fires are patchy–leaving pockets of unburned areas. Prohibits wildfire conditions from developing (i.e., vast accumulation of highly-flammable, dead vegetation.)" http://edis.ifas.ufl.edu/UW124 **Review: Relevant to the Project** *We agree.*
4	**Taxpayers for Common Sense. "From the Ashes: Reducing the Harmful Effects and Rising Costs of Western Wildfires." Washington DC , Dec. 2000** "The agency's commercial timber program can contribute to the risk and severity of wildfire in the National Forests, yet Congress devotes nearly one-third of the Forest Service's entire budget to this wasteful program." (pg. 1) "Do not utilize the commercial timber program to reduce the risk of fire. Commercial incentives undercut forest health objectives and can actually increase the risk of fire." (pg. 9) "Commercial logging, especially of larger, fire-resistant trees, in the National Forests is one of several factors contributing to the risk and severity of wildfire." (pg. 19) "Commercial logging and logging roads open the forest canopy, which can have two effects. First, it allows direct sunlight to reach the forest floor, leading to increased evaporation and drier forests.5 As a consequence, ground fuels (grass, leaves, needles, twigs, etc.) dry out more quickly and become susceptible to fire. Second, an open canopy allows more sunlight to reach the understory trees, increasing their growth.6 This can lead to weaker, more densely-packed forests." (pgs. 19-20) "Congress and the Forest Service continue to rely on the commercial logging program to do something it will never accomplish – reduce fire risk.

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	The commercial logging program is designed to provide trees to private timber companies, not to reduce the risk of fire." (pg. 20) http://www.ourforests.org/fact/ashes.pdf **Review: Not Relevant to the Project** *This paper calls for Congressional reforms to "reduce the harmful effects and the escalating cost of Western wildfires." The citations reference the effects of logging on wildfire risk reduction. The purpose and need for the Flint Foothills Vegetation Management Project does not include a reduction in fire risk or severity.*
4	**The Ecology Center, Inc., v. United States Forest Service United States Court of Appeals, Tenth Circuit, June 29, 2006** **An Appeal from the United States District Court for the District of Utah (D.C. No. 4:03-CV-589-TS)** http://www.ca10.uscourts.gov/opinions/05/05-4101.pdf **Review: Not Relevant to the Project** *The lawsuit involves the Griffin Springs Resources Management Project on the Dixie National Forest and whether the analysis considered the best available science in managing for the northern goshawk. The Forest Plan incorporates the requirements of the Utah Northern Goshawk Conservation Strategy and Agreement for the Management of Northern Goshawk Habitat in Utah (the "Conservation Strategy"); the Conservation Strategy states that the Forest Service report, Management Recommendations for the Northern Goshawk in the Southwestern United States (the "Reynolds Report') is considered the best available science on managing the northern goshawk. The project was developed under the 1986 Dixie National Forest Plan, which was developed under the 1982 planning rule. After the EIS was completed the Forest Service looked at other data in managing the northern goshawk and issued a Supplemental EIS that considered these studies. The Record of Decision for the project was signed in 2003. The Forest Service and the court acknowledged that the transition provision of the 2000 transition planning rule applied to the project. Under these regulations, the Forest service was required to consider the "best available science" when implementing site-specific project under the forest plan. In the record of decision for the Griffin Springs project, there was no mention of the 2000 transition rule; and the court was unable to determine whether the "Forest Service's reliance on other available data satisfies the "best available science" requirements." The Flint Foothills Vegetation Management Project is guided by the Forest Plan for the Beaverhead-Deerlodge Forest, which was developed under the transition provisions of the 2000 planning rule, which allows continued use of the 1982 rule procedures for revisions and amendments. The analysis for the Flint Foothills Project adheres to the "best available science" requirements.*
4	**The Wilderness Society. 2003. "Dead Trees and Healthy Forests: Is Fire Always Bad?" March 2003.** "Forested landscapes may be thought of as living "crazy quilts," with patches formed occasionally through the action of natural and human-caused disturbances like fire, windstorms, and logging. Prior to the advent of modern logging technology, virtually every North American forest experienced occasional renewal through the action of fire. In some places, fire was a frequent visitor, killing very few large trees as it burned harmlessly through the forest litter and grass. In most places, though, fire burned only occasionally, creating patches of severely burned forest as it raced through the canopy under extreme weather conditions. In these patches, old forests were killed, soon to be replaced by young, rejuvenated stands. This cycle

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	of forest maturation, death, and replacement was critical to maintaining the diversity and vitality of the ecosystem." http://www.wildfirelessons.net/documents/Dead-Trees-and-Healthy-Forests.pdf **Review: Not Relevant to the Project** *The policy brief is a short discussion on fire effects, with the key points being: fire and other disturbances are essential processes; thinning is not appropriate in all forest types; dead trees are a natural part of a healthy ecosystem; and salvage logging is not necessary to prevent future fire. The project analysis in agrees with all of the key points; however, the policy brief is not a peer-reviewed, scientifically-based citation.*
1	**Thomas, A. G. & Dale, H. M. (1975). "The role of seed reproduction in the dynamics of established populations of *Hieracium floribundum* and a comparison with that of vegetative reproduction." Canadian Journal of Botany, 53, 3022-3031.** "Yellow and Orange Hawkweed – These species can persist in shaded conditions and often grow underneath shrubs making eradication very difficult. Their stoloniferous (growing at the surface or below ground) habit can create dense mats that can persist and spread to densities of 3500 plants per square mile (Thomas and Dale 1975)." **Review: Not Relevant to the Project** *This paper further investigates the role of seed reproduction in the establishment of hawkweed and compares it to vegetative reproduction. Hawkweed was not located within the project area during the 2011 invasive species mapping effort.*
4	**Thomas, Craig. "Living with risk: Homeowners face the responsibility and challenge of developing defenses against wildfires." *Sacramento Bee* newspaper, July 1, 2007.** "Indiscriminate logging is not a viable solution to reducing wildfire risk. Logging can actually increase fire danger by leaving flammable debris on the forest floor. Loss of tree canopy lets the sun in, encouraging the growth of brush, increases wind speed and air temperature, and decreases the humidity in the forest, making fire conditions even worse." http://www.sierraforestlegacy.org/NR_InTheNews/SFLIP_2007-07-01_SacramentoBee.php **Review: Not Relevant to the Project** *This is an opinion piece, not a peer reviewed research paper.*
4	**Thomas, Jack Ward Ph.D., US Forest Service Chief. "Dead Wood: From Forester's Bane to Environmental Boon". Keynote address at the symposium on ecology and management of deadwood in western forests, Reno, Nevada. 1999.** "In retrospect, it is amazing that forest managers did not realize that dead wood was a critical habitat component for vertebrate and invertebrate wildlife and for the forest itself." http://www.fs.fed.us/psw/publications/documents/gtr-181/003_Thomas.pdf

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	Review: Relevant to the Project *The DEIS recognizes that snags and downed logs are important to wildlife and addresses the effects of project activities on these habitat components.*
1	**Thorpe, Andrea S, Vince Archer, and Thomas H. DeLuca. 2006. The invasive forb, Centaurea maculosa, increases phosphorus availability in Montana grasslands. Applied Soil Ecology 32: 118–122.** **http://appliedeco.org/about-us/staff/andrea-s-thorpe-ph-d-1/Thorpe%20et%20al%202006_centaurea%20and%20phosphorus.pdf** As related to letter 1, comment 35; additional literature to address **Review: Relevant to the Project** *This paper is relevant to the Flint Foothills project as Centaurea maculosa is present in the project area along roads and in rangeland. Thorpe et al. (2006) performed several experiments to test the soil phosphorous (P) level in grasslands invaded by Centaurea maculosa Lam. (Asteraceae, spotted knapweed) as well as the efficiency of spotted knapweed both in the field and the greenhouse. While not tested directly, it has been suggested that spotted knapweed is able to outcompete native species for soil P. Results from this study show that while spotted knapweed has the ability to acquire more P than native species, its ability to acquire P was not related to a depletion in the soil P. Experiments by Thorpe et al. (2006) suggest that while P uptake by native plants does not change from uninvaded to invaded sites, spotted knapweed utilizes P more efficiently than native plants leading to increased biomass.* *Spotted knapweed is present in the project area; therefore, the potential for impacts to soil productivity exists as a result of noxious weed infestation. However, the actual impact to long term soil productivity is likely minimal, due to the following:* *The Invasive Plant resource report describes a low risk of noxious weeds becoming established and/or spreading in proposed treatment units within the analysis area.* *The mitigation measures listed in the DEIS include monitoring for and treating noxious weeds within units and along roads.* *Treatment of noxious weeds with herbicides on the Beaverhead-Deerlodge NF has been effective (infested acres reduced by 49% over the last ten years on the Pintler Ranger District) (Rasor 2012).*
4	**Tidwell, Tom. USFS Chief. 2009. Statement from an interview with Rob Chaney of the *Missoulian,* June 19, 2009.** "We have some of the best science, and we need to make sure we're applying that, using that and sharing that as we move forward. I think we have a key leadership role, not only in the application of science but to help inform and educate our community and the folks we work with." http://westinstenv.org/sosf/2009/06/19/tidwell-interviewed-by-the-missoulian/ **Review: Not Relevant to the Project** *The excerpt is from an interview that touched on a variety of topics, including focused areas of watershed management and climate change, not*

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	directly referencing the Flint Foothills Vegetation Management Project. Chief Tidwell remarked that the Forest Service has a leadership role with respect to climate change, as stated in the excerpt provided. The Flint Foothills project analysis considers the relevant, latest and best science available; over 100 references are cited in the analyses.
4	**Trombulak, Stephen C. Ph.D. and Christopher A. Frissell Ph.D. "Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities" Conservation Biology, Volume 14, No. 1, Pages 18–30, February 2000.** "Roads are a widespread and increasing feature of most landscapes. We reviewed the scientific literature on the ecological effects of roads and found support for the general conclusion that they are associated with negative effects on biotic integrity in both terrestrial and aquatic ecosystems. Roads of all kinds have seven general effects: mortality from road construction, mortality from collision with vehicles, modification of animal behavior, alteration of the physical environment, alteration of the chemical environment, spread of exotics, and increased use of areas by humans. Road construction kills sessile and slow-moving organisms, injures organisms adjacent to a road, and alters physical conditions beneath a road. Vehicle collisions affect the demography of many species, both vertebrates and invertebrates; mitigation measures to reduce roadkill have been only partly successful. Roads alter animal behavior by causing changes in home ranges, movement, reproductive success, escape response, and physiological state. Roads change soil density, temperature, soil water content, light levels, dust, surface waters, patterns of runoff, and sedimentation, as well as adding heavy metals (especially lead), salts, organic molecules, ozone, and nutrients to roadside environments. Roads promote the dispersal of exotic species by altering habitats, stressing native species, and providing movement corridors. Roads also promote increased hunting, fishing, passive harassment of animals, and landscape modifications. Not all species and ecosystems are equally affected by roads, but overall the presence of roads is highly correlated with changes in species composition, population sizes, and hydrologic and geomorphic processes that shape aquatic and riparian systems. More experimental research is needed to complement post-hoc correlative studies. Our review underscores the importance to conservation of avoiding construction of new roads in roadless or sparsely roaded areas and of removal or restoration of existing roads to benefit both terrestrial and aquatic biota." http://www.transwildalliance.org/resources/200922144524.pdf **Review: Relevant to the Project** *The citation is a general synthesis of some of the deleterious effects of roads on the natural environment reported by peer-reviewed science publications. It is very broad based and contains some concepts that are addressed in the Flint Foothills wildlife analysis. Analysis of roads and their effects to aquatic species is discussed in the EIS.*
1	**USDA. 1998. Deer Creeks Prescribed Burn Proposal and Predicted Effects on Upland Game birds. October 13, 1998. Gallatin National Forest, Big Timber Ranger District.** As related to letter 1, comment 35; additional literature to address **Review: Not Relevant to the Project** *The reference document could not be located and, therefore, could not be reviewed and assessed as additional literature to address.*

Letter Number	Literature
1	**USDA. 1998. Deer Creeks Prescribed Burn Proposal and Predicted Effects on Deer, Elk and Antelope. October 13, 1998. Gallatin National Forest, Big Timber Ranger District.** As related to letter 1, comment 35; additional literature to address **Review: Not Relevant to the Project** *The reference document could not be located and, therefore, could not be reviewed and assessed as additional literature to address.*
1	**USDA. 1998. Deer Creek Prescribed Burn Proposal, Effects on Neotropical Migratory Birds. October 13, 1998. Gallatin National Forest, Big Timber Ranger District.** As related to letter 1, comment 35; additional literature to address **Review: Not Relevant to the Project** *The reference document could not be located and, therefore, could not be reviewed and assessed as additional literature to address.*
1	**USDA. 2000. Expert interview summary for the Black Hills National Forest Land and Resource Management Plan amendment. USDA Forest Service. Black Hills National Forest. Custer South Dakota.** **http://maps.wildrockies.org/ecosystem_defense/Federal_Agencies/Forest_Service/Region_2/Black_Hills_Expert_Interview_Sum.pdf** As related to letter 1, comment 35; additional literature to address **Response: Relevant to the Project.** *This will be incorporated into the Botany Report/BE. The suggested reading is a review process conducted by the Black Hills National Forest for Forest Plan Amendment. The Forest utilized outside experts to gather information pertaining to Forest sensitive species that would help them in the Forest Plan Amendment process. One species is shared between the Black Hills sensitive plant list and the Beaverhead-Deerlodge sensitive plant list (Epipactis 254igantean), and two genera are shared (Carex and Botrychium).* *Though the reading really pertains to Forest Plan Amendment and incorporating long term management decisions for sensitive plants, there were several useful points brought up by the experts that could be addressed in a project specific EA and include:* *-Botrychium detection during surveys is difficult and taxonomic questions are present* *-timber harvest within Botrychium habitat could impact Botrychium species of activities occur where plants occur* *-weed control can benefit sensitive plant species, but the control methods can be harmful (broadcast spraying)* *-invasion of exotic species is a long term impact to sensitive plant species* *-noxious weed control activities are a short term impact*

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	Long term management decisions mentioned during the interview that are more appropriate for Forest Planning, but are not appropriate for incorporation into a project specific EA include: *-the creation of several "standards" and "guidelines." The Beaverhead-Deerlodge has the following Forest Plan Goal: Sensitive plant populations and their habitat are maintained or restored.* *Large core populations or fringe-of-range populations of sensitive plants are conserved in research natural areas, botanical special interest areas, or protected as populations in conservation strategies, or project design specifications (Scale – Populations).* *-the creation of "conservation areas" or buffers for sensitive plant protection in the Forest Plan* *-comprehensive surveys across the forest (not project specific). This has been discussed on the Beaverhead-Deerlodge, but money is currently the limiting factor, as there is support for the Rocky Mountain Herbarium to conduct such surveys* *-developing a monitoring program of sensitive plant species. The Beaverhead-Deerlodge, under Forest Plan direction has begun monitoring of the G1-G3 sensitive plant species, which includes 15 sensitive plant species.* *The reference consists of the comments of taxa experts interviewed to assess the LRMP amendment for the Black Hills National Forest. While most information pertains specifically to the Black Hills, some species-specific information provided by the panel can be used to help identify habitat requirements and potential management effects to several species analyzed in the Flint Foothills Project.*
1	**USDA Forest Service. 2005a. "Sheep Creek Fire Salvage Project Final Environmental Impact Statement." Beaverhead-Deerlodge National Forest.** "The Sheep Creek Salvage FEIS (USDA Forest Service, 2005a) states at p. 173: Noxious weed presence may lead to physical and biological changes in soil. Organic matter distribution and nutrient flux may change dramatically with noxious weed invasion. Spotted knapweed (*Centaurea biebersteinii* D.C.) impacts phosphorus levels at sites (LeJeune and Seastedt, 2001) and can hinder growth of other species with allelopathic mechanism. Specific to spotted knapweed, these traits can ultimately limit native species' ability to compete and can have direct impacts on species diversity (Tyser and Key 1988, Ridenour and Callaway 2001)." **Review: Relevant to the Project** *The EIS cited was completed for the Sheep Creek fire salvage project on the Wisdom Ranger District. Although the research papers address spotted knapweed effects in grassland plant communities (versus forested communities), the papers cited in the EIS are still relevant to the Flint Foothills project. LeJeune and Seastedt (2001) reviewed the literature along with their own unpublished data and state that based on preliminary evidence, it appears that knapweed is a strong competitor for phosphorous and water, and is able to do well in grasslands once limited by nitrogen. Nitrogen is no longer a limiting resource due to increased anthropogenic disturbances over the past century, which has made nitrogen more available (through reduced fire frequency, atmospheric deposition of nitrogen, and possibly direct and indirect fertilization from grazing). Phosphorous and water are the new limiting resources and knapweed does well in competing for them. Tyser and Key (1988) performed a study in Glacier National Park and found spotted knapweed could invade native fescue grasslands. Further, they found an inverse relationship between knapweed stem density and species richness and frequency of several species, and concluded that knapweed has the ability to alter plant*

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	community composition. Ridenour and Calloway (2001) performed a greenhouse study to determine the allelopathic affects that spotted knapweed has on Idaho fescue. They found that spotted knapweed reduces Idaho fescue growth primarily through allelopathy but also through resource competition (nutrients, space, water). We agree that noxious weeds have the potential to affect soil productivity; however, the effects of weeds on soil productivity are very minimal due to limited weed presence along roadsides (not productive soils) and ongoing weed treatments in accordance with the Beaverhead-Deerlodge National Forest Noxious Weed Control Record of Decision (USDA Forest Service 2002). The forestwide noxious weed situation is discussed in the Beaverhead-Deerlodge National Forest Noxious Weed Control FEIS (USDA Forest Service 2002). In short, soil quality indicators are "normal" in infestations that have been treated successfully. On weed-dominated sites that have not been treated or where treatment has not been very effective, "organic matter is lower and structure in the surface soil may have been altered. Erosion rates appear to have increased in some cases."
1	**USDA Forest Service. 2007. "Sagebrush in western North America: habitats and species in jeopardy." Pacific Northwest Research Station. March, 2007** **http://www.fs.fed.us/pnw/sciencef/scifi91.pdf** As related to letter 1, comment 35; additional literature to address **Review: Not Relevant to the Project** *There is no sagebrush in the Flint Foothills Project area*
4	**USDA Forest Service. "Forest Management: A Historical Perspective."** "During the post-World War II housing boom, national forests were viewed as a ready supply of building material. The increased demand for timber from national forests led to widespread use of commodity-oriented harvesting techniques such clearcutting. Along with the increased logging that followed, concern over the environment increased. In the 1960's and 1970's, several laws were enacted to protect forests. Additional laws formalized the concept of "multiple-use," whereby the uses of timber, forage, and water shared equal footing with wildlife conservation and recreation opportunities." http://www.fs.fed.us/forestmanagement/aboutus/histperspective.shtml **Review: Not Relevant to the Project** *This website assembles commonly understood historical information; it does not provide anything directly applicable in this project.*
4	**University of California; SNEP Science Team and Special Consultants 1996. "Sierra Nevada Ecosystem Project: Final Report to Congress." Volume 1, Chapter 4 – Fire and Fuels.** "Timber harvest, through its effects on forest structure, local microclimate, and fuels accumulation, has increased fire severity more than any other recent human activity."(pg.62) http://ceres.ca.gov/snep/pubs/web/PDF/v1_ch04.pdf

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	Review: Not Relevant to the Project *On the same page of the report it also states that silvicultural treatments can mimic the effects of fire on structural patterns of woody vegetation, and that climatic variation plays an important role in influencing fire patterns and severity. Slash created through harvest activities would be mitigated through whole tree yarding at central landing sites for disposal.*
1	**USDA Forest Service. Lewis and Clark NF, Dry Fork EA Appendix D at p. 9** "Population viability analysis is not plausible or logical at the project level such as the scale of the Dry Fork Vegetation and Recreation Restoration EA. Distributions of common wildlife species as well as species at risk encompass much larger areas than typical project areas and in most cases larger than National Forest boundaries. No wildlife species that presently occupy the project area are at such low numbers that potential effects to individuals would jeopardize species viability. No actions proposed under the preferred alternative would conceivably lead to loss of population viability. (Lewis and Clark NF, Dry Fork EA Appendix D at p. 9.)" http://www.fs.fed.us/r1/lewisclark/projects/dryfork_web/ **Review: Not Relevant to the Project** *The reference document could not be located and, therefore, could not be reviewed and assessed as additional literature to address.*
4	**USDI Fish and Wildlife Service. Regulations and Policies. MBTA. List of Migratory Birds** Using the link to the bird species protected under the Migratory Bird Treaty Act please indicate in the EA the bird species that exist in the project area or have habitat in the project area. http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtandx.html **Review: Relevant to the Project** *The Flint Foothills Project wildlife analysis addresses migratory birds and provides a list of migratory bird species pertinent to the analysis area and identified by the USFWS as Birds of Conservation Concern.*
4	**Valetkevitch, Heidi. National Media Officer USDA Forest Service, to Joe Bauman, reporter for the *Deseret Morning News* December 24, 2004. (Statement)** "The new rule directs forest managers to use the best science available to protect species at a landscape level. The emphasis is to preserve ecosystems as a whole." http://www.deseretnews.com/article/600100084/New-forest-rules-focus-on-holistic-approach.html **Review: Relevant or Not Relevant to the Project**

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	The "new rule" discussed in this article is the final 2005 planning rule, which provided the framework for the Forest Service in revising land and resource management plans (Forest Plans). It included an Environmental Management System (EMS) to be used during the planning process. Per the excerpt provided by the commenter to the Flint Foothills Vegetation Management Project, the rule also directed forest managers to consider the best available science in making decisions at a landscape level. The Forest Service is currently working under the transition provision of the 1982 planning rule. Under these regulations, the Forest Service is required to consider the "best available science" when implementing site-specific projects within a forest plan. 36 C.F.R. § 219.35(a) (2001). The Flint Foothills Vegetation Management Project considers the latest and best science available—over 100 references are cited in the analyses.
1	**Veblen, T.T. 2003. "Key issues in fire regime research for fuels management and ecological restoration." Pages 259-276 in: P. Omi and L. Joyce (technical eds). *Fire, Fuel Treatments and Ecological Restoration: Conference proceedings*; 2002 16-18 April; Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 475 p.** "Veblen (2003) questions the premises the FS often puts forth to justify "uncharacteristic vegetation patterns" discussions, that being to take management activities to alter vegetation patterns in response to fire suppression." http://www.colorado.edu/geography/biogeography/publications/VeblenFireConfPaper2003.pdf **Review: Relevant to the Project** *The summary quote above from the commenter is not an accurate summary of the alternative; rather, the paper asserts that the limitations of fire history methodology and reliance on summary fire statistics (fire regime research) may result in developing an inappropriate or ineffective management strategy. The caution provided in the paper is that broad generalizations and premises need to be carefully examined for particular ecosystems and management objectives. In other words, "fuels management and ecological restoration need to be attentive to proper place and appropriate time" (Veblen 2003). The project analysis does exactly what the paper recommends, namely using appropriate, current, and to the extent possible Regionally specific research to determine the 'proper place and appropriate time' for the proposed management actions.*
4	**Vernetti, Toni. 2007. "Are You Wildfire Aware?" June 07.** "Wildfires have been a natural part of our environment since time began. Under the right circumstances these wildfires can be beneficial to an ecosystem." "Wildfires consume vegetation that would otherwise become overgrown, creating ideal conditions for a catastrophic wildfire. Wildfires allow more open spaces for new and different kinds of vegetation to grow and receive sunlight. This, in turn, provides fresh nutrients and shelter for forest plants and animals. Wildfires also keep our forests healthy by consuming harmful insects and diseases." http://www.googobits.com/articles/p0-547-are-you-wildfire-aware.html **Review: Not Relevant to the Project** *The article referenced is a very general wildfire awareness educational piece for an independent articles and advice internet site. The article is not a peer-reviewed, scientifically based paper.*

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4	**Vincent, James W. Ph.D., Daniel A. Hagen, Ph.D., Patrick G. Welle Ph.D. and Kole Swanser. 1995. "Passive-Use Values of Public Forestlands: A Survey of the Literature." A study conducted on behalf of the U.S. Forest Service.** "The development of sound forest-management policies requires that consideration be given to the economic benefits associated with competing uses of forest resources. The benefits that may be provided under different management regimes include both use values (such as those provided by timber harvesting and recreation) and passive-use (or nonuse) values, including existence value, option value and quasi-option value. Many of these benefits are not revealed in market transactions, and thus cannot be inferred from conventional data on prices and costs." http://www.icbemp.gov/science/vincent.pdf **Review: Not Relevant to the Project** *This paper is an effort to explain natural resource economics concepts, mainly how to apply non-market valuation techniques. Although non-market economics are mentioned as a consideration in the specialist report, the examples offered here are not relevant to this project as habitat is not expected to be substantially modified and is not at a scale that would harm wildlife populations, nor affect non-market values.*
4	**Voss, René, Ph.D. 2002. "Getting Burned by Logging." *The Baltimore Chronicle.* July.** "Fire is an essential, natural and necessary part of Western forest ecology. Many species of trees can only reproduce after fires occur. Wildland fires burn underbrush and return important nutrients to the soil." http://www.baltimorechronicle.com/firelies_jul02.shtml **Review: Relevant or Not Relevant to the Project** Response: Relevant to the project. We agree.
4	**Voss, René, Ph.D. 2002. "Getting Burned by Logging." *The Baltimore Chronicle.* July.** "Unfortunately, there are a number of massive logging proposals, disguised as hazardous fuels treatments that have put environmentalists at odds with the Forest Service. Nearly all of these proposals focus primarily on the removal of mature and old-growth trees. These proposals continue even with overwhelming evidence that commercial logging is more of a problem than a solution. There's simply a cognitive disconnect between the Forest Service's scientists and its timber sale planners, whose budgets are dependent upon selling valuable mature trees. Ironically, this very type of logging, experts inform us, is likely to increase, not decrease, the frequency and severity of wildland fires. In the Forest Service's own National Fire Plan, agency scientists warned against the use of commercial logging to address fire management. The report found that 'the removal of large, merchantable trees from forests does not reduce fire risk and may, in fact, increase such risk.' " http://www.baltimorechronicle.com/firelies_jul02.shtml **Review: Not Relevant to the Project**

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	This quotation is: 1) opinion with no reference to supporting material, 2) general and not specific to the Flint Foothills project; therefore, there is nothing substantive to comment on. The Flint Foothills project is not proposing to thin mature and old-growth trees, please refer to chapter 2 of the EIS for the proposed treatments.
4	**Watson, Mark L. "Habitat Fragmentation and the Effects of Roads on Wildlife and Habitats." Background and Literature Review 2005.** "Roads are a major contributor to habitat fragmentation because they divide large landscapes into smaller patches and convert interior habitat into edge habitat. As additional road construction and timber harvest activities increase habitat fragmentation across large areas, the populations of some species may become isolated, increasing the risk of local extirpations or extinctions (Noss and Cooperrider 1994)." "Habitat fragmentation creates landscapes made of altered habitats or developed areas fundamentally different from those shaped by natural disturbances that species have adapted to over evolutionary time (Noss and Cooperrider 1994 in Meffe et al. 1997). Adverse effects of habitat fragmentation to both wildlife populations and species include: "Increased isolation of populations or species, which leads to: Adverse genetic effects; i.e. inbreeding depression (depressed fertility and fecundity, increased natal mortality) and decreased genetic diversity from genetic drift and bottlenecks, Increased potential for extirpation of localized populations or extinction of narrowly distributed species from catastrophic events such as hurricanes, wildfires or disease outbreaks, Changes in habitat vegetative composition, often to weedy and invasive species, Changes in the type and quality of the food base, Changes in microclimates by altering temperature and moisture regimes, Changes in flows of energy and nutrients, Changes in the availability of cover and increases edge effect, bringing together species that might otherwise not interact, potentially increasing rates of predation, competition and nest parasitism, and Increased opportunities for exploitation by humans, such as poaching or illegal collection for the pet trade." http://www.wildlife.state.nm.us/conservation/habitat_handbook/documents/2004EffectsofRoadsonWildlifeandHabitats.pdf **Review: Relevant to the Project** *This paper includes a list of potential effects of roads and highways. It also includes an appendix with a literature review of road effects to wildlife and habitats, with the literature cited following it. The quoted section above lists potential effects of roads.* *It is recognized that lower-standard, unpaved Forest roads have potential effects. The effects of displacement and avoidance were addressed in the Forest Plan and provides wildlife secure habitat through management of open motorized road and trail densities. This direction is discussed in the Flint Foothills Project wildlife analysis.*
4	**West Arm Watershed Alliance. 2000. "Applying Ecological Principles to Management of the U.S. National Forests" Issues in Ecology**

Letter Number	Literature
	Number 6 Spring 2000 "Timber harvest will remove dead and dying material from the site and inhibit the recruitment of downed woody material as time progresses. Timber harvest and associated r educed structural complexity and reduced age and size class diversity are all known to reduce population abundance and diversity of ants and a number of birds. For instance, ants are documented to require downed woody material in a variety of sizes and in all stages of decomposition (Torgersen and Bull, 1995). This is an attribute that is negatively correlated with harvest of the dead and dying trees and positively correlated with natural succession, especially after disturbance. Ants and birds are known to predate on insect species which cause mortality to trees, serving as a potentially important population control in the case of epidemics or before they occur (Campbell, Torgersen and Srivastava, 1983). Structural and functional characteristics associated with unlogged forests are also important for canopy arthropods, which play an important role in regulating pest outbreaks (Schowalter, 1989). Structural complexity, functional diversity, diversity of ecological process and diversity of structure in roadless areas are all expected to be less susceptible to the outbreak of pests and regulate insect activity in surrounding homogenized forests (Schowalter and Means, 1989; Franklin, Perry, Schowalter, Harmon, McKee and Spies, 1989). A large body of scientific evidence also indicates that increased edge effect and increased sunlight into stands, resulting from reduced canopy cover associated with timber harvest, can directly promote the population abundance, productivity and persistence of insects which cause mortality to trees of (Roland, 1993; Rothman and Roland, 1998; Kouki, McCullough and Marshall, 1997; Bellinger, Ravlin and McManus, 1989)." http://www.watertalk.org/wawa/ecosci.html **Review: Relevant to the Project** *This is a journal article in which the authors describe what they believe are ecological considerations that should be incorporated in sound forest management policy and their potential impacts on current practice. However, it contains no sources, references, or literature cited and is not scientific, peer-reviewed literature. The paper summarizes some potential effects of timber harvest and roads.* *The importance of snags and downed wood was recognized during the development of the Forest Plan and standards were incorporated into the Forest Plan, and the project was designed to retain these habitat components in harvest units and would meet Forest Plan direction.* *Salvage with clearcut activities removing dead and dying material from the site are proposed on about 2 percent of the 44,522-acre project area, or 6 percent of the 18,141 acres identified as lodgepole pine, with 100% of the stands affected by mountain pine beetle. Reduced canopy cover from thinning in Douglas-fir and ponderosa pine stands increases resilience, thus increasing the defensive response to insect attacks and promoting more open-grown stand conditions that favor ponderosa pine. The proposed activities would reduce canopy cover in Douglas-fir-ponderosa pine stands to 40-60 ft2 of basal area per acre on 1,146 acres (3% of the project area) with Alternative 2 and 666 acres (2% of the project area) with Alternative 3.*
4	**West Arm Watershed Alliance. 2000. "Applying Ecological Principles to Management of the U.S. National Forests" Issues in Ecology Number 6 Spring 2000.** "Roads may have unavoidable effects on streams, no matter how well they are located, designed or maintained. The sediment contribution to

Letter Number	Literature
	streams from roads is often much greater than that from all other land management activities combined, including log skidding and yarding.' (Gibbons and Salo 1973). Research by Megahan and Kidd in 1972 found that roads built in areas with highly erosive soils can contribute up to 220 times as much sediment to streams as intact forests." http://www.watertalk.org/wawa/ecosci.html **Review: Relevant to the Project** *This peer-reviewed article looks at forest management and ecology and includes a brief review of some of the sources of sedimentation from forested landscapes. Protection of water quality and yield and prevention of flooding and landslides call for greater attention to the negative impacts of logging roads and the value of undisturbed buffer zones (RCAs) along streams and rivers. This project recognizes the importance of roads as a sediment source to streams, and would use BMPs during project implementation to reduce the effects of roads on sediment yield*
1	**Whisenant, S. 1990. Changing fire frequencies on Idaho's Snake River Plains: ecological and management implications. Page 4-10 in Proceedings – Symposium on cheatgrass invasion, shrub die-off and other aspects of shrub biology and management. USDA Forest Service. Intermountain Research Station. General Technical Report INT-276.** **Review: Relevant to the Project** See previous response on this citation.
4	**Wisdom, Michael J., Richard S. Holthausen Ph.D., Barbara C. Wales Ph.D. Christina D. Hargis Ph.D., Victoria A. Saab Ph.D., Danny C. Lee Ph.D., Wendel J. Hann Ph.D. Terrell D. Rich, Mary M. Rowland, Wally J. Murphy, and Michelle R. Eames "Source Habitats for Terrestrial Vertebrates of Focus in the Interior Columbia Basin: Broad-Scale Trends and Management Implications Volume 2 – Group Level Results." USDA Forest Service, PNW-GTR-485, May 2000.** "Our analysis also indicated that >70 percent of the 91 species are affected negatively by one or more factors associated with roads." "Roads in forested areas increase trapping pressures for martens and fishers, resulting in significantly higher captures in roaded versus unroaded areas (Hodgman and others 1994) and in logged versus unlogged areas, in which the difference was again attributed to higher road densities in logged stands (Thompson 1994). Secondary roads also might increase the likelihood that snags and logs will be removed for fuel wood. This could impact fishers, martens and flammulated owls, and also could have a negative effect on the prey base for goshawks (Reynolds and others 1992)." "An additional, indirect effect of roads is that road avoidance leads to underutilization of habitats that are otherwise high quality." http://maps.wildrockies.org/ecosystem_defense/Science_Documents/Wisdom_et_al_2000/Vol_2a.pdf **Review: Relevant or Not Relevant to the Project** *It is recognized that lower-standard, unpaved Forest roads have potential effects. The effects of displacement and avoidance were addressed in the*

Letter Number	Literature
	Forest Plan and provides wildlife secure habitat through management of open motorized road and trail densities. This direction is discussed Flint Foothills wildlife analysis.
4	**Woodford, Riley. 2003. "Regeneration Following Fire Creates Fertile Habitat for Wildlife" *Alaska Fish and Wildlife News*. August.** "People are bombarded with the negative aspects of fire," Paragi said. "You hear terms like 'destroyed thousands of acres of forest,' and the thought of destruction gets embedded in the public mind. But fire is a natural part of the ecosystem and it is actually very important." "Fire opens up the forest canopy and allows sunlight to reach the ground, stimulating the organisms that decompose organic matter and make nutrients available to plants. Fire burns off the insulating layer of moss and duff, allowing sunlight to further warm the soil. The ash can release nutrients back into the soil and change soil chemistry, promoting plants growth." http://www.wildlife.alaska.gov/index.cfm?adfg=wildlife_news.view_article&issue_id=5&articles_id=60 **Review: Not Relevant to the Project** *The reference is a news article for the Alaska Department of Fish and Game website talking about the benefits of fire for wildlife habitat. This is not a peer-reviewed scientifically-based article. Additionally, the project also views fire as a beneficial disturbance.*
4	**Wright, Bronwen, Policy Analyst and Attorney Pacific Rivers Council Excerpt from a May 11, 2009 letter to the Rogue River-Siskiyou National Forest Travel Management Team** "According to the DEIS, the Forest now manages a total of 5,914 miles of roads across the Forest. Scientific literature has established that roads have numerous widespread, pervasive and, if left untreated, long-lasting biological and physical impacts on aquatic ecosystems that continue long after completion of construction. (Angermeier et al. 2004). Roads increase surface water flow, alter runoff patterns, alter streamflow patterns and hydrology, and increase sedimentation and turbidity. Roads are the main source of sediment to water bodies from forestry operations in the United States. (US EPA 2002). Road construction can lead to slope failures, mass wasting and gully erosion. Road crossings can act as barriers to movement for fish and other aquatic organisms, disrupting migration and reducing population viability. (Schlosser and Angermeier 1995). Chemical pollutants that enter streams via runoff, such as salt and lead from road use and management, compound these impacts. Most of these adverse effects are persistent and will not recover or reverse without human intervention. The techniques for road remediation are well established, agreed upon and readily available. (Weaver et al. 2006)" (Pg. 2) http://www.pacificrivers.org/protection-defense/comment-letters/Rogue%20River%20Siskiyou%20TMP%20DEIS.pdf **Review: Not Relevant to the Project** *This non-peer-reviewed article is not relevant to the project. It does mention some of the general effects of roads and lack of road maintenance on turbidity and sedimentation in streams however, it is a response to a travel management plan on the Rogue-Siskiyou National Forest and comments are specific to that forest.*
4	**Wuerthner, George. 2008. "Ecological Differences between Logging and Wildfire."**

Letter Number	Literature
	"Fires do not leave a large road network in place (assuming the blaze was not suppressed otherwise there may be dozer lines, etc.). Logging creates roads that fragment habitat and generally increase human access, both of which affect the use of the land by wildlife. Moreover, roads and logging equipment can become vectors for the dispersal of weeds." http://wuerthner.blogspot.com/2008/12/ecological-differences-between-logging.html **Review: Not Relevant to the Project** *This is not a peer-reviewed article. The author states that wildfire is an important ecological process that is not emulated by logging practices, and distinguishes the effects from wildfire on the ecosystem vs. the effects from timber harvest. The effects he describes are generic in nature and not specific to the conditions in the Flint Foothills project area. The purpose and need for the project does not include mimicking effects from a large-scale fire, though the size and location of some proposed treatment units were designed to encompass stands created by past disturbance patterns and subsequent logging in the early 20th century.*
4	**Wuerthner, George. "Logging, thinning would not curtail wildfires" *The Eugene Register-Guard*, December 26, 2008.** "Another surprising finding is that mechanical fuels treatment, commonly known as logging and thinning, typically has little effect on the spread of wildfires. In fact, in some cases, it can increase wildfires' spread and severity by increasing the fine fuels on the ground (slash) and by opening the forest to greater wind and solar penetration, drying fuels faster than in unlogged forests." http://wuerthner.blogspot.com/2008/12/logging-thinning-would-not-curtail.html **Review: Not Relevant to the Project** *This is an opinion piece, not a peer reviewed research paper.*
4	**Wuerthner, George. "Logging, thinning would not curtail wildfires" *The Register – Guard* (Eugene Ore.), December 26, 2008.** "Healthy ecosystems burn, and often burn by the tens of millions of acres. The spate of large wildfires we are experiencing now are not "abnormal" or an indication of "unhealthy" forest. Rather, we are seeing the natural response of a healthy forest ecosystem. Given that wildfire was so common for thousands of years, it is not surprising that recent research shows that wildfires, particularly severe wildfires, increase biodiversity. If anything, we probably need more wildfire, not less. With global warming we will probably get it, as vegetative communities adapt to new climatic realities." http://wuerthner.blogspot.com/2008/12/logging-thinning-would-not-curtail.html **Review: Not Relevant to the Project** *This is an opinion piece, not a peer reviewed research paper.*

Letter Number	Literature
4	**Wuerthner, George. "Who Will Speak For the Forests?" *New West*, January 27, 2009.** "Logging equipment compacts soils. Logging removes biomass critical to future soil productivity of the forest. Logging disturbs sensitive wildlife. Logging typically requires roads and skid trails which create chronic sources of sedimentation that degrades water quality and aquatic organism habitat. Logging roads and skid trails are also a major vector for the spread of weeds. Logging disrupts nutrient cycling and flows. Logging can alter species composition and age structure (i.e. loss of old growth). Logging can alter fire regimes. Logging can change water cycling and water balance in a drainage. The litany of negative impacts is much longer, but suffice it to say that anyone who suggests that logging is a benefit or benign is not doing a full accounting of costs." Those who suggest that logging "benefits" the forest ecosystem are using very narrow definitions of "benefit." Much as some might claim that smoking helps people to lose weight and is a "benefit" of smoking." http://www.newwest.net/topic/article/who_will_speak_for_the_forests/C564/L564/ **Review: Relevant or Not Relevant to the Project** *This is an opinion paper, not peer-reviewed literature. The author believes that the only responsible uses of public lands are those that do not impair the lands and that the "real" ecological costs of logging need to be articulated to determine whether exploitation is justified. The role of environmental organizations is to continuously challenge the assumption that there is the "need" to log the forests, articulate the costs, and advocate responsible behavior that will reduce the demand for wood products. The Flint Foothills Vegetation Management Project implements direction in the Forest Plan. The environment effects of the alternatives are addressed by resource in the environmental consequences section of the DEIS. Project-specific design features are developed to reduce or eliminate adverse impacts from project activities, and are incorporated as an integrated part of the proposed action.*
4	**Wuerthner, George. "Temporary Roads are Like Low Fat Ice Cream." *New West.* March 17, 2009.** Please consider the following information: Sometimes temporary roads create more sediment per mile than system roads. This is because: 1) The earth must be handled twice … when constructing the road and when obliterating the road. 2) Temp roads are "designed" by a logger on a cat with no knowledge of hydrology and the logger is under pressure to work quickly. 3) Most temp roads are outsloped, thus, the water on the road drains off the road at random places. 4) Temp roads have no surfacing to slow the water velocity. High water velocity picks up more sediment particles. 5) Temp roads have no ditch. Ditches adjacent to system roads control the water until the road designer calls for an appropriate outlet culvert location. 6) Sediment-laden water leaves the temp road at random locations . . . often in the streams. Please read **"Temporary Roads are Like Low Fat Ice Cream"** by George Wuerthner, 3-17-09. The link to this article is at: http://www.newwest.net/topic/article/temporary_roads_are_like_low_fat_ice_cream/C564/L564/

Letter Number	Literature
	Review: Relevant to the Project *This non-peer-reviewed periodical article highlights some of the effects of temporary roads on turbidity and sedimentation. The article says temporary roads are like low fat ice cream, they seem to taste good, but as any nutritionist can tell you, you're are infinitely better off if you don't consume a lot of ice cream at all—low fat or otherwise. The same is true for roads. Temporary roads are only slightly better than a regular road, and no one should be fooled into thinking they somehow eliminate the negative impacts associated with roads just because they are "temporary".* *Because this project proposes to obliterate temporary roads after use, the effects of temporary roads will be reduced significantly. Most temporary roads are located away from stream channels and are not in RCAs. This will reduce the risk of sediment generated from temporary roads getting into stream channels. Further, BMPs such as water bars will be used to help disburse runoff and control sediment eroded from temporary roads.*
4	**Wuerthner, George. 'Pine Beetle Fears Misplaced' *Helena Independent Record,* March 25, 2010** "The current pine beetle "outbreak" that has led to tree mortality among Rocky Mountain forests has prompted some people to suggest that beetles are "destroying" our forests and that beetle-killed trees will invariably lead to larger wildfires. At the heart of this issue are flawed assumptions about wildfires, what constitutes a healthy forest and the options available to humans in face of natural processes that are inconvenient and get in the way of our designs. While it may seem intuitive that dead trees will lead to more fires, there is little scientific evidence to support the contention that beetle-killed trees substantially increase risk of large blazes. In fact, there is evidence to suggest otherwise." http://helenair.com/news/opinion/article_f3d671f0-37c9-11df-921d-001cc4c002e0.html **Review: Not Relevant to the Project** *This is an opinion piece in the Helena, MT newspaper. This is not a peer-reviewed scientifically-based article. Additionally, the proposed project does not assert that 'beetles are destroying' the project area, or that there is a 'substantially increase risk of large blazes'.*
1	**Yurkonis, Kathryn, Scott J, Meiners, and Brent E. Wachholder. 2005. Invasion impacts diversity through altered community dynamics. Journal of Ecology: 93, 1053–1061** **http://hmf.rutgers.edu/Pubs%20since%201982/Yurkonis%20Meiners%20and%20Wacholder%202005.pdf** As related to letter 1, comment 35; additional literature to address **Review: Not Relevant to the Project** *The article briefly discusses the various mechanisms of weed invasion impact to a community. Their study aimed to determine the mechanism for change within an invaded community. They looked at 4 exotic species invasions within abandoned agricultural fields in New Jersey, USA. In conclusion, they found species richness to decline with increased invasion intensity as a result of decreased colonization rates. Dissimilar to previous studies of invasion interactions, this study found no strong functional group interactions. This may be due to the highly disturbed successional study site where this study was conducted. The study clearly states that their "model system may not provide results applicable to*

Letter Number	Literature
	exotic invasions into previously undisturbed communities," as their model system utilized abandoned agricultural fields. In conclusion, the study proposes both neighborhood and population scales become standard scales for assessing invasion impacts. Though the study was interesting to read, the Forest Service will not be conducting similar studies and instead relies on the information provided through peer reviewed literature to analyze invader impacts on native communities.
4	**Ziemer, Robert R. Ph.D., "Effect of logging on subsurface pipeflow and erosion: coastal northern California, USA." Proceedings of the Chengdu Symposium, July 1992. IAHS Publication. No. 209, 1992.** "After logging, peak pipeflow was about 3.7 times greater than before logging." "The use of heavy logging equipment was expected to compact the soil, reduce infiltration rates, and increase surface runoff. In addition, heavy equipment might collapse some of the subsurface pipes, increasing local pore water pressure and the chance of landslides (Sidle, 1986)." http://www.fs.fed.us/psw/publications/ziemer/Ziemer92.PDF **Review: Relevant to the Project** *This peer-reviewed article looks at alterations in hillslope hydrology following logging. Significant alterations in hillslope hydrology are not expected as a result of this project. No potential flow increases are expected in project watersheds as a result of the project*
4	**Zimmerman, E.A. and P.F. Wilbur. "A Forest Divided" New Roxbury Land Trust newsletter, 2004.** "Forest fragmentation occurs when large, contiguous blocks of forest are broken up into isolated islands by development, roads, or clearing for agriculture. Just as inbreeding among the royal families of Europe spread hemophilia, forest fragmentation negatively impacts the long term sustainability of both plant and animal communities. Geographic isolation results in inbreeding and diminishes biodiversity." http://www.ourbetternature.org/forestfrag.htm **Review: Not Relevant to the Project** *This opinion piece discusses general impacts of forest fragmentation without reference to peer-reviewed literature citations. While the article contains several concepts related to fragmentation of habitats that would be considered for the analysis, it lacks the specificity necessary to address impacts to individual species.*
The Following 18 Statistically Significant Polls of Randomly Selected Americans Indicate that they do not Approve of Commercial Timber Sales in their National Forests	
4	Ignoring the clear message of the following 18 polls indicates that the Responsible Officials thinks the members of the public are pesky outsiders attempting to interfere in Forest Service business. **Poll #1** Who was Polled: New England residents

Letter Number	Literature
	Number of People Polled: 1,257 total Maine – 300, New Hampshire – 301, Vermont – 301 and Massachusetts, Connecticut, and Rhode Island – 355 Date(s) of Poll: July 2002 Question: How important to you personally is it to ensure that there are areas where people can go for recreation where there are no motorized vehicles or logging? Poll Findings: Southern NE / Northern NE Very Important: 74% / 69% Somewhat Important: 20% / 24% Link to Poll: http://www.brspoll.com/Reports/report-final.pdf **Review: Not relevant to the project** **Poll #2** Who was Polled: Residents of West Virginia Number of People Polled: 948 West Virginians at least 18 years of age living in households with telephones. Because the survey was designed to be a representative sample of all West Virginians, it was necessary to interview a specific person in the household. Therefore, interviewers asked to speak with the adult in the household with the most recent birthday. Date(s) of Poll: 1996 Question: Are West Virginia's current environmental laws for timber harvesting: 1) too restrictive, 2) fine as is, or 3) not restrictive enough? Poll Findings: 1) too restrictive: 3.6% 2) fine as is: 37.0% 3) not restrictive enough: 42.1% Link to Poll: http://www.polsci.wvu.edu/ipa/par/report_16_1.pdf **Review: Not relevant to the project** **Poll #3**

Letter Number	Literature
	Who was Polled: New England residents Number of People Polled: 1,500 Date(s) of Poll: summer of 1998 Question: Do you oppose or support protection of all remaining undisturbed forest? Poll Findings: 94% supported protection of all remaining undisturbed forest. Link to Poll: http://www.forestwatch.org/content.php?id=53 **Review: Not relevant to the project** **Poll #4** Who was Polled: Americans picked randomly nationwide from voter listings Number of People Polled: 800 registered voters Date(s) of Poll: June 22-25, 1998 Question: There has been a national debate about whether the U.S. Forest Service should continue to sell timber from our national forests. Do you favor or oppose continuing to allow timber companies to log in our national forests? Poll Findings: strongly favor logging in our national forests: 7% somewhat favor logging in our national forests: 17% neither: 2% somewhat oppose logging in our national forests: 19% strongly oppose logging in our national forests: 50% don't know 5% Link to Poll: http://www.sdearthtimes.com/et0998/et0998s6.html **Review: Relevant to the project** **Poll #5** Who was Polled: adult residents from across the province of Nova Scotia Number of People Polled: 400 Date(s) of Poll: 2003 Question: "Some people say that protecting more wilderness areas in Nova Scotia is necessary to conserve native plants and animals and for outdoor recreation. Others say there are already enough protected areas, and that to create more would be too costly, particularly for resource-

Letter Number	Literature
	based industries such as forestry and mining. All things considered, do you personally believe there should be more, the same amount, or fewer protected wilderness areas on publicly owned Crown land in Nova Scotia?" Poll Findings: More protected areas: 69% Same amount of protected areas: 28% Less protected areas: 3% Link to Poll: http://www.publicland.ca/news/040203.html **Review: Not relevant to the project** **Poll #6** Number of People Polled: 472 people living in Vermont Date(s) of Poll: February, 2002 Question: On a scale of 1 to 10, with 1 not being important and 10 being extremely important, how important is it for the Green Mountain National Forest to provide opportunities for logging, grazing, or mining? Poll Findings: 65% did not favor traditional development activities such as logging, grazing or mining. Link to Poll: http://crs.uvm.edu/wildpoll/exec_summ.pdf **Review: Not relevant to the project** **Poll #7** Who was Polled: North Carolina adults Number of People Polled: 584 Date(s) of Poll: Oct. 19-30, 1998 Question: In general, do you strongly support, somewhat support, somewhat oppose, or strongly oppose commercial logging in North Carolina's national forests? Poll Findings: 62% of adult residents opposed commercial logging in North Carolina's national forests Link to Poll: http://www.unc.edu/news/archives/feb99/carpoll3.htm **Review: Not relevant to the project** **Poll #8** Who was Polled: Alabama registered voters

Letter Number	Literature
	Number of People Polled: 400 Date(s) of Poll: 2000 Question: Do you favor logging on national forests? Poll Findings: 74% opposed logging 13% favored logging 13% were not sure. Link to Poll: http://www.wildlaw.org/newsletters/July2000.htm **Review: Not relevant to the project** **Poll #9** Who was Polled: Residents of Oregon and Washington Number of People Polled: 600 Date(s) of Poll: May 2001 Question: Should old-growth forests on national forest lands be protected from logging? Poll Findings: Yes – 75% Link to Poll: http://www.conservationnw.org/library/newsletter/newsletter-pdfs/fall-ecosystemnews-2001.pdf **Review: Not relevant to the project** **Poll #10** Who was Polled: Randomly selected Georgia residents Number of People Polled: 792 Date(s) of Poll: January 21 – February 1, 1998 Question: Recently there has been a national debate about whether the United States Forest Service should be allowed to sell timber from Federal public lands, such as the Chattahoochee and Oconee National Forests. In general, do you support or oppose commercial logging in Georgia's national forests? Poll Findings: Support Logging – 19.6% Oppose Logging – 72.3% Don't Know / No Answer – 8.1%

Letter Number	Literature
	Link to Poll: http://www.johnmuirproject.org/resources-summary-of-polling-data-1998.html **Review: Not relevant to the project** **Poll #11** Who was Polled: Randomly selected Ohio residents Number of People Polled: 476 Date(s) of Poll: 1997 Question: Do you Support or Oppose Logging in Ohio's Wayne National Forest? Poll Findings: Support Logging – 26.5% Oppose Logging – 73.5% Link to Poll: http://www.johnmuirproject.org/resources-summary-of-polling-data-1998.html **Review: Not relevant to the project** **Poll #12** Who was Polled: Randomly selected registered voters in the United States Number of People Polled: 800 Date(s) of Poll: June 9-14, 1999 Question: Do you Support or Oppose Logging in Ohio's Wayne National Forest? Poll Findings: 63% felt too little of the national forests are protected from commercial development and would favor a proposal that protects all roadless areas of 1,000 acres and larger. Link to Poll: http://community.seattletimes.nwsource.com/archive/?date=19990806&slug=2975897 **Review: Not relevant to the project** **Poll #13** Who was Polled: Oregon and Washington residents Number of People Polled: 600 Date(s) of Poll: fall 2001

Letter Number	Literature
	Question: Do you support protecting public old-growth forests from logging? Poll Findings: 75% of Oregon and Washington residents support protecting public old-growth forests from logging (Pg. 9) Link to Poll: http://www.conservationnw.org/library/newsletter/newsletter-pdfs/fall-ecosystemnews-2001.pdf **Review: Not relevant to the project** **Poll #14** Who was Polled: Alabama registered voters Number of People Polled: 400 Date(s) of Poll: 2000 Question: Do you favor or oppose National Forest logging? Poll Findings: 74% opposed logging, 13% favored logging and 13% were not sure. Link to Poll: http://www.wildlaw.org/newsletters/July2000.htm **Review: Not relevant to the project** **Poll #15** Who was Polled: 344 district rangers and 124 forest supervisors randomly selected from a current organizational roster provided by the Washington Office of the Forest Service. Number of People Polled: 316 Of the 468 line officers selected, 246 (72 percent) of the district rangers and 70 (56 percent) of the forest supervisors returned usable questionnaires. Date(s) of Poll: 1990 Poll Findings and Questions: Table 1 (Pg 455) Mean scores on RPA questions for District Rangers and Forest Supervisors (Scale I to 5, I = Favorable, 5 = Unfavorable)

RPA Question	District Rangers N=246	Forest Supervisors N=70

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Increased production of wood from National forest System lands	3.91	3.99
Use of herbicides on brush in National Forest management	3.02	3.40
Use of pesticide to control insect losses in National Forest management	2.85	2.71
User payment for non-market services from National Forest lands	2.36	2.26
Development of National Forest lands for recreation purposes	1.77	1.60
Livestock forage development on National Forest lands	3.06	3.01
Development of energy-related and other minerals on National Forest lands	2.84	2.74

Link to Poll: http://www.nationalaglawcenter.org/assets/bibarticles/brownharris_forest.pdf

Review: Relevant to the project.

Results of this study repeated twice in time are included in the economics specialist report.

Poll #16

Who was Polled: randomly selected voters in Washington state likely to vote in the November 2000 general election

Number of People Polled: 500

Date(s) of Poll: October 14-18, 1999

Poll Findings:

68% favor protecting existing natural areas for habitat and recreation by making them off limits to development and activities like logging and mining

Most (80%) likely voters say environmental issues are important to them when deciding how to vote, including a strong majority of Democrats (91%), Independents (80%), and Republicans (69%)

Link to Poll: http://www.lcvef.org/programs/polling-research/state-polling/LCVEF_Washington-Poll_Oct1999.pdf

Review: Not Relevant to the Project

Poll #17

Who was Polled: Americans randomly selected in the lower 48 states. A poll contracted by Chief Thomas.

Number of People Polled: 5,064

Date(s) of Poll: 2002

Questions and Poll Findings:

Public Beliefs about the roles of the Forest Service in their administration of the national forests.

Letter Number	Literature

The Forest Service should	Average Public Response	Page
Conserve and protect watersheds	4.61	32
Preserve natural resources through policies such as no timber, no mining	4.21	37
Protecting ecosystems and wildlife habitat	4.53	55
Restrict timber harvest and grazing	3.94	56

1 = public feels that the action is not important for the Forest Service to undertake
5 = public feels that the action should be something emphasized by the Forest Service
Link to Poll: http://www.fs.fed.us/rm/pubs/rmrs_gtr095.pdf
USDA Forest Service RMRS GTR-95
Review: Relevant to the Project.
This study generally supports the purpose and need of the project.
Poll #18
Who was Polled: Registered voters in the Western United States
Number of People Polled: 1000
Date(s) of Poll: between Dec. 28, 1999 to Jan. 2, 2000
Question: Do you support or oppose allowing logging, mining and other industrial activities on national forest lands?
Poll Findings: Oppose-60% Support-31%
Link to Poll: http://www.gilawilderness.com/local/roadsurvy2.htm
Review: Relevant to the project

Appendix C – Forest Plan Consistency

Table C- 1. Forest Plan standards and how they relate to the Flint Foothills Project

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
Air Quality			
1.	Meet Smoke management requirements according to the Idaho/Montana Airshed Group Operating Guide.	Yes; Air Quality section of DEIS, p.101.	
American Indian Rights and Interests			
1.	No impact to identified TCPs shall occur until Forest officials consult with the tribe or other cultural group who identified the property and their concerns have been considered. TCPs shall be identified through proactive consultation with affected tribes.	Yes; Heritage report, in the project file.	
Aquatic Resources			
1.	Riparian Conservation Area (RCA) -1 Any activity in RCAs shall be designed to enhance, restore, or maintain the physical and biological characteristics of the RCA by implementing the following requirements. Activities in RCAs, that meet or exceed RMOs, must be designed to maintain existing stream function. Activities in RCAs that are not meeting RMOs shall include a restoration component, commensurate with the scope of the activity affecting the fishery, which trends towards accomplishing desired stream function, as part of the project. Activities in RCAs shall not result in long-term degradation to aquatic conditions. Limited short-term effects from activities in the RCA may be acceptable when outweighed by the long-term benefits to the RCA and aquatic resources.	Yes; Hydrology section in the DEIS p.263.	
2.	Evaluate the risks of aquatic nuisance /exotic species introduction as part of project analysis (Scale – Project area).	Yes; Aquatics section in the DEIS p. 297.	

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
3.	Snow courses, snow pack telemetry sites, and precipitation gauges will be protected from project activity including maintenance of an adequate buffer to maintain reliability (scale – project area).	N/A	There are no snow courses, snow pack telemetry sites or precipitation gauges in the Flint Foothills Project area.
4.	Watersheds that provide water for public water supplies (i.e. where waters are classified by the State of Montana as A-Closed or A-1) shall be managed to meet State water quality standards established for protection of drinking water quality and be consistent with applicable source water protection plans.	N/A	There are no watersheds that provide water for public water supplies in the Flint Foothills Project area.
5.	New activities within known sensitive amphibian breeding sites and natal areas during breeding and juvenile rearing periods will not cause a threat to population viability or a trend toward federal listing (scale – breeding sites and natal areas identified at the project level).	N/A	There are no proposed activities near known amphibian breeding sites, and no harvest or road building is proposed in RCAs for the Flint Foothills Project.
6.	New management activities in restoration key watersheds will be consistent with recovery of desired aquatic systems.	N/A	There are no restoration key watersheds in the Flint Foothills Project area.

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
7.	Guidance defined in 16.2 – Section 1 (Permit Administration) of Beaverhead-Deerlodge Supplement No. 2209.13-98-1 to the Grazing Permit Administration Handbook Title 2209.13 will become mandatory rather than discretionary in Fish Key Watersheds when grazing contributes to degraded westslope cutthroat or bull trout stream conditions, and there is noncompliance with livestock grazing standards; or other aspects of livestock grazing permits terms and conditions.	N/A	The Flint Foothills DEIS is not a grazing document
8.	New projects will have a beneficial effect or no measurable negative effect on westslope cutthroat or bull trout in Fish Key Watersheds. Short-term negative effects are acceptable if outweighed by long-term benefits.	N/A	There are no fish key watersheds in the Flint Foothills Project area.
9.	Restoration projects should correct existing problems, not mitigate effects created by proposed activities (WR 3).	N/A	This is not a restoration project.
10.	If the only suitable location for incident bases, camps, helibases, staging areas, helispots and other centers for incident activities are within the RCA, an exemption may be granted following a review and recommendation by a resource advisor. The line officer will prescribe the location, use conditions, and rehabilitation requirements with avoidance of adverse effects to native fish and sensitive aquatic species as a primary goal.	N/A	There are no incident activities proposed as part of the Flint Foothills Pproject.
11.	Monitor water quality and aquatic resources in fish key watersheds where chemical retardant, foam, or additives are delivered to surface waters. Monitoring should take place as soon as conditions allow for safe access.	N/A	There are no fire suppression activities proposed as part of the Flint Foothills Project. There are no plans to add these substances to the surface waters.

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
12.	Require instream flows and habitat conditions for hydroelectric and other surface water development proposals to maintain or restore riparian resources, favorable channel conditions, fish passage, reproduction, and growth. Coordination will occur with the USFWS, other federal, state, and local agencies. (LH 1). During re-licensing of hydroelectric projects, provide written and timely license conditions to the Federal Energy Regulatory Commission (FERC) , that require fish passage and flows and habitat conditions that maintain/restore riparian resources and channel integrity. Coordinate re-licensing projects with the appropriate state agencies.	N/A	The Flint Foothills Project does not involve new or existing hydroelectric facilities.
13.	Locate new hydroelectric ancillary facilities for existing permits, outside RCAs. For existing ancillary facilities inside the RCA essential to proper management, provide recommendations to FERC to assure the facilities would not prevent attainment of the desired stream function and adverse effects on native fish and sensitive aquatic species are avoided. Where these objectives cannot be met, provide recommendations to FERC that such ancillary facilities should be relocated. Locate, operate, and maintain hydroelectric facilities that must be located in RCAs to avoid effects that would retard or prevent attainment of the desired stream function and avoid adverse effects on native fish and sensitive aquatic species (LH 2).	N/A	The Flint Foothills Project does not involve new or existing hydroelectric facilities.
14.	Grazing practices that prevent attainment of desired stream function, or are likely to adversely affect threatened or endangered species, or adversely impact sensitive species, are modified to attain desired stream function or population objectives (GM 1).	N/A	The Flint Foothills Project is not making decisions about grazing.
15.	Locate new livestock handling and/or management facilities outside of Riparian Conservation Areas. For existing livestock handling facilities inside Riparian Conservation Areas, assure facilities do not prevent attainment of desired stream function. Relocate or close facilities where these objectives cannot be met (GM 2).	N/A	The Flint Foothills Project is not making decisions about grazing.
16.	Limit livestock trailing, bedding, watering, salting, loading, and other handling efforts to those areas and times that would not retard or prevent attainment of desired stream function or adversely affect native fish and sensitive aquatic species (GM 3).	N/A	The Flint Foothills Project is not making decisions about grazing.

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
17.	If a notice of intent indicates a mineral operation would be located in an RCA, the effects of the activity on native fish and sensitive aquatic species is considered in the determination of significant surface disturbance pursuant to 36 CFR 228.4. For operations in an RCA, operators take all practicable measures to maintain, protect, and rehabilitate fish and wildlife habitat, which may be affected by the operations. Bonding requires the cost of stabilizing, rehabilitating, and reclaiming the area of operation will be covered (MM 1).	N/A	The Flint Foothills Project does not propose a mineral operation.
18.	Where no alternative to placing facilities in RCAs exists, facilities are located and constructed in ways that avoid impacts to RCAs and streams and adverse effects on native fish and sensitive aquatic species. Where no alternative to road construction exists, roads are kept to the minimum necessary for the approved mineral activity. Roads no longer required for mineral or land management activities are closed, revegetated, or obliterated (MM 2).	N/A	The Flint Foothills Project does not propose a mineral operation.
19.	Solid and sanitary waste facilities in RCAs are prohibited. If no alternative to locating mine waste (waste rock, spent ore, tailings) facilities in RCAs exists, releases can be prevented, and stability can be ensured, then (MM 3): Analyze the waste material using the best conventional sampling methods and analytic techniques to determine its chemical and physical stability characteristics. Locate and design the waste facilities using the best conventional techniques to ensure mass stability and prevent the release of acid or toxic materials. If the best conventional technology is not sufficient to prevent such releases and ensure stability over the long term, prohibit such facilities in Riparian Conservation Areas. Monitor waste and waste facilities to confirm predictions of chemical and physical stability, and make adjustments to operations as needed to avoid adverse effects to native fish and sensitive aquatic species and to attain desired stream function. Reclaim and monitor waste facilities to assure chemical and physical stability and re-vegetation to avoid adverse effects to native fish and sensitive aquatic species, and to attain the desired stream function. Reclamation bonds are adequate to ensure long-term chemical and physical stability and successful re-vegetation of disturbed areas and mine waste facilities.	N/A	The Flint Foothills Project does not involve solid or sanitary waste facilities.

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
20.	Sand and gravel mining and extraction within RCAs are prohibited (MM 5).	N/A	The Flint Foothills Project does not propose sand and gravel mining.
21.	Provide and maintain fish passage at new, replacement, and reconstructed road crossings of existing and potential fish-bearing streams, unless barriers are determined beneficial for native fish and/or sensitive aquatic species conservation (RF 5).	Yes; the aquatic section in the DEIS, p.297..	
22.	Complete watershed analysis prior to constructing roads or landings in RCAs within fish or restoration key watersheds (RF 2a).	N/A	No roads or landings are proposed in the fish key watersheds. There are no restoration watersheds in the Flint Foothills Project area.
23.	Where adjustments of recreation use impacts on desired stream function are not successful terminate activity or occupancy (RM 1).	N/A	The Flint Foothills Project is not making decisions on recreation use.

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
24.	Chemical pesticides and toxicants will be applied in a manner consistent with desired stream function and avoids adverse biological effects (RA 3).	Yes. A design feature in the proposed action provides that weeds would be treated following direction in the Noxious Weed Control Program Record of Decision (2002) for the Beaverhead-Deerlodge National Forest. Application would be consistent with this standard, DEIS, p.43.	
25.	Project-related storage of fuels and toxicants within riparian conservation areas is prohibited. Refueling within riparian conservation areas is prohibited except for emergency situations, in which case refueling sites must have an approved spill containment plan (RA 4).	Yes; project design features, DEIS, p. 43.	
26.	Fuelwood cutting and salvage in RCAs will not prevent or retard attainment of desired stream function (TM 1a).	N/A	The Flint Foothills Project does not propose fuelwood cutting; salvage would not occur within RCAs
27.	Vegetation and/or fuel management prescriptions in RCAs will be for the purpose of restoring, enhancing, or protecting the physical and biological characteristics of the RCA including Riparian Management Objectives. Vegetation and/or fuel treatments, for the purpose of protecting urban interface, private property and other investment, and public safety in RCAs shall be designed so as not to prevent the attainment of desired stream function (TM 1).	N/A	The Flint Foothills Project does not propose managing RCAs.

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
28.	Complete the evaluation of ongoing activities in fish key watersheds. Activities or conditions inconsistent with goals and objectives will be identified within 3 years and timeframes for implementation of mitigation will be identified.	N/A	The Flint Foothills Project is not evaluating ongoing activities in fish key watersheds.
Fire Management			
1	Wildland fire use plans shall be developed in coordination with the appropriate county, state, tribal, and other federal agencies.	N/A	The Flint Foothills Project does not include fire use planning.
2.	Wildland fire use is an available tool for all unplanned ignitions.	N/A	The Flint Foothills Project does not include fire use planning.
Heritage Resources			
1.	Heritage resources determined eligible for listing in the National Register of Historic Places will be preserved in place, or a consensus determination of "no adverse effect" will be reached with the Montana SHPO, the Advisory Council on Historic Preservation, and appropriate Indian tribes.	Yes; Heritage Report in the project file.	
2.	Unplanned discoveries of heritage resources during project implementation shall cause project operations in the area of the discovery to cease until analysis and evaluation of the heritage resources are completed, including consultation with the Montana SHPO and appropriate Indian tribes.	Yes; addressed in the project design features and mitigation measures section, DEIS, p.43.	
3.			
Infrastructure			

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
1.	Facility Design: Use the Rocky Mountain and Great Plains sections of the Built Environment Image Guide, (USDA FS-710, Dec. 2001), or equivalent for development of recreation sites, administrative sites, and approval of special use structures and facility design.	N/A	The Flint Foothills Project does not include facility development.
Lands			
1.	Energy transmission facilities shall be located only in designated utility corridors shown on the Utility Corridor and Communication Site map at the end of Chapter 3. Energy gathering or distribution facilities may be located outside of designated corridors.	N/A	The Flint Foothills Project does not include an energy transmission facility.
2.	Wireless telecommunication facilities shall be located in designated communication sites and utility corridors shown on the Utility Corridor and Communication Site map. Exceptions may be made for nonground-disturbing temporary facilities that are in place for less than one year.	N/A	The Flint Foothills Project does not include a wireless telecommunications facility.
3.	Comply with direction in USDA Forest Service Designation of Section 368 Energy Corridors on National Forest System Land in 10 Western States Decision by Secretary of Agriculture To Amend Land Management Plans Described as the Environmentally Preferred Alternative January 14, 2009.	N/A	The Flint Foothills Project does not involve an energy corridor.
Livestock Grazing			
1.	The interim standards in Table 6 apply to livestock grazing operations unless or until specific long-term objectives, prescriptions, or allowable use levels have been designed through individual resource management plans or site-specific NEPA decisions; for example, revised allotment management plans or Wilderness management plans. Interim standards apply to the following situations: Any allotment management plan lacking riparian management objectives and guides designed specifically for that allotment. Any riparian recreation site used primarily by recreation stock. Any outfitter operation where stock are grazed in a riparian area that lacks a specific riparian grazing strategy in the annual operating plan.	N/A	The Flint Foothills Project does not address compliance of livestock grazing operations with existing allotment management plans, including these interim standards.

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
2.	Domestic livestock grazing will not be allowed in developed recreation sites unless specifically permitted.	N/A	The Flint Foothills Project does not address compliance of livestock grazing operations with existing allotment management plans, including these interim standards.
3.	Allotment management plans will identify specific criteria for special areas, such as wet meadows, where limiting grazing at certain times of the years or under certain conditions is necessary to protect resources.	N/A	The Flint Foothills Project does not propose an allotment management plan.
4.	Base Property Requirement – ownership of facilities and land capable of producing feed for livestock 50% of the time permitted livestock are not grazing on National Forest, will be demonstrated before issuing grazing permits.	N/A	The Flint Foothills Project does not involve issuance of grazing permits.
Minerals, Oil, and Gas			
1.	Use the following table to describe the lease terms and prescribe stipulations for the Beaverhead Unit. Appendix B contains detailed language. (see Forest Plan Chapter 3, p. 27).	N/A	The Flint Foothills Project does not involve mineral, oil or gas leases.
2.	Any new road constructed for oil and gas activity will be obliterated unless the road is needed as part of the Forest Service permanent transportation system.	N/A	The Flint Foothills Project does not involve mineral, oil or gas leases.
3.	All drill pads will be obliterated.	N/A	The Flint Foothills Project does not involve a drill pad.

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
Recreation and Travel Management			
1.	Permanent road construction is not allowed in summer nonmotorized allocations or in areas evaluated for wilderness potential.	Yes; proposed permanent road construction is located in the road-based allocation within the Flint Foothills MA, DEIS, p. 349.	The Flint Foothills Project does not involve permanent road construction.
2.	Motorized vehicles are not allowed in summer or winter nonmotorized allocations except for permitted or administrative use.	Yes; a project design feature design feature applies travel restrictions DEIS, p. 43.	
3.	Restrict year-round, wheeled motorized travel to designated routes or areas. Where routes have not been designated through site-specific travel planning, restrict motorized vehicles to open motorized routes identified on the Forest Plan Interim Roads and Trails Inventory GIS Layer displayed on page 53. Motorized wheeled travel on routes leading to identified dispersed campsites is allowed. Exceptions may be authorized for: Motorized wheeled cross-country travel for any military, fire, search and rescue, or law enforcement vehicle used for emergency purposes. Authorized motorized wheeled cross-country travel is limited to official administrative duties or emergency services such as, fire suppression, prescribed fire, noxious weed control, vegetation restoration, surveying, and law enforcement. Motorized wheeled cross-country travel for other government entities on official administrative business as authorized through the normal permit processes or a memorandum of understanding. Motorized wheeled cross-country travel for lessees and permittees limited to terms described in the federal lease or permit.	Yes; closed unauthorized routes would be used as temporary roads, then decommissioned after authorized activities are complete, DEIS, table 6.	

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
4.	Extreme sport courses such as motocross trails, technical mountain bike courses, and motor vehicle challenge routes will not be constructed.	N/A	The Flint Foothills Project does not involve extreme sport courses.
5.	New outfitter and guide permits or increases in existing permits, will be only be made based on need, administrative capability, and a suitable mix of guided and nonguided public capacity determined by a forestwide capacity study. This mix may vary by type of activity and/or season of use. Capacity validation will be made on an area-specific basis when the general forestwide capacity determination does not adequately address the management situation. Heli-skiing operations will not be permitted.	N/A	The Flint Foothills Project does not involve outfitter and guide permits.
6.	New recreation resorts or residence tracts will not be permitted, nor will permits be issued for unoccupied tracts or lots.	N/A	The Flint Foothills Project does not involve recreation resorts or residence tracts.
7.	Manage summer nonmotorized allocations for either a primitive or semi-primitive nonmotorized setting from May 16 thru December 1, (p. 54).	N/A	The Flint Foothills Project would not change the management of summer nonmotorized areas.
8.	Manage winter nonmotorized allocations for a primitive or semi-primitive nonmotorized setting from December 2 thru May 15, (p. 55).	N/A	The Flint Foothills Project would not change the management of winter nonmotorized areas.

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
9.	Manage summer backcountry allocations for a semi-primitive motorized setting from May 16 thru December 1, (p. 54).	N/A	The Flint Foothills Project would not change the management of summer backcountry allocations.
10.	Manage recommended Wilderness for primitive or semi-primitive nonmotorized settings and protect Wilderness character.	N/A	There are no recommended Wilderness areas in the Flint Foothills Project area.
11.	Commercial timber harvest is prohibited in recommended Wilderness.	N/A	The Flint Foothills Project is not proposed in Wilderness.
12.	Road construction is not permitted in recommended Wilderness.	N/A	The Flint Foothills Project is not proposed in Wilderness.
13.	Wheeled or motorized vehicles designed for the primary purpose of transporting people, except for wheel chairs, are prohibited in recommended Wilderness except for permitted or administrative uses.	N/A	The Flint Foothills Project is not proposed in Wilderness.
Scenic Resources			
1.	Where no minimum SIOs are identified by landscape or management area – prior to the completion of a forestwide scenic integrity map – the objectives for scenery shall be determined by procedures outlined in the Landscape Aesthetics Handbook, Agricultural Handbook No. 701. The analysis shall use the Scenic Concern Level List in Appendix A, Scenic Attractiveness GIS layer, and the Scenery Integrity Level Matrix below. (See Forest Plan Chapter 3, p. 33).	Yes; see Scenic Resources section of DEIS, p.374.	

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
2.	Projects in nonmotorized and summer backcountry allocations will be designed to meet a minimum SIO of Moderate. Use the Scenic Concern Level List in Appendix A, Forestwide Scenic Attractiveness GIS layer, and Scenic Integrity Level Matrix above to determine a site-specific SIO. Project-level analysis may determine a higher SIO to be appropriate.	N/A	The Flint Foothills Project is not located in nonmotorized or summer backcountry allocations.
3.	Projects in foreground areas of scenic byways, national scenic trails or wild and scenic rivers will be designed to meet the SIO of at least High.	Yes; see Scenic Resources section of DEIS p. 374.	
Soils			
1.	The most current Northern Region Soil Quality Standards are adopted as Forest Plan soil standards.	Yes; see Soils section of the DEIS, p. 236.	
2.	Ground-based yarding shall not be allowed on slopes exceeding 35% without site-specific environmental analysis that shows damage is unlikely and soil goals and objectives can be met.	Yes; see Soils section of the DEIS, p. 236.	
Special Designations			
1.	Research Natural Areas or Special Interest Areas will be managed in accordance with their individual management plans in addition to the regulations (36 CFR 251.23), and the policy (FSM 4063 and 2370) pertaining to these areas.	N/A	The Flint Foothills Project is not associated with Research Natural Areas or Special Interest Areas.
2.	Streams determined to be Eligible for protection under the Wild and Scenic Rivers Act will be protected to maintain Outstandingly Remarkable Values. Standards for protection are provided in Forest Service Manual 1909.12.8.2.	N/A	There are no eligible streams within the project areas or otherwise associated with the Flint Foothills Project

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
Timber Management			
1.	On lands suitable for timber production, even aged harvest may occur only upon a finding that it is the appropriate and optimum method for the timber type and will contribute to meeting vegetative objectives for the site. Such harvest must be consistent with the protection of soil, watershed, fish, wildlife, recreation, and aesthetic resources. Harvest areas shall be blended to the extent practicable with the natural terrain.	Yes; Vegetation Report in the project file.	
2.	On lands suitable for timber production, the maximum size of openings created by one regeneration harvest operation shall not exceed 40 acres. Exceptions can be made where a natural event, such as fire, insect, disease, or windthrow created an undesirable opening. A regeneration harvest larger than 40 acres may be allowed after public notice, and review and approval by the officer one level above the responsible official. This only applies to harvest on suitable timber lands for timber production activities.	Yes; see Proposed Action section and the Vegetation section of the DEIS, pp. 5 and 64.	
3.	On lands suitable for timber production, even aged management regeneration harvest shall not occur unless the stand has reached the culmination of mean annual increment. An exception occurs where the primary purpose of treatment is for wildlife enhancement, visual enhancement, riparian area improvement or public safety or protection of property. The culmination of mean annual increment of growth requirement does not apply to cutting for experimental or research purposes; to nonregeneration harvests, such as thinning or other stand improvement measure; to management of uneven aged stands or to stands under uneven aged silvicultural system; and to salvage or sanitation harvesting of timber stands which are substantially damaged by events such as fire, insects, disease or windthrow. This only applies to harvest on suitable timber lands for timber production activities.	Yes; Vegetation Report in the project file.	
4.	Replace natural barriers to livestock movement removed by harvest activities with some other barrier.	Yes; project design features and mitigation measures, DEIS, p. x.	
5.	When trees are cut to achieve timber production objectives the cuttings shall be made in such a way as to assure that the technology and knowledge exists to adequately restock the lands.	Yes; Vegetation section of the DEIS, p. x.	

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
6.	The following Timber Harvest Classification Protocol establishes where timber harvest is not allowed and where timber harvest is permitted to meet other resource objectives. (See Forest Plan Chapter 3, pages 39-42.)	Yes; Vegetation section DEIS. p. 64.	
Vegetation			
1.	Mechanical vegetation treatments and prescribed fire in old growth stands (see Glossary) do not reduce the age and number of large trees and basal area below the 'minimum criteria' required for Eastern Montana old growth in Green et al, Table 3. Removing hazardous fuels within old growth stands is allowed if conducted in a manner that meets this requirement. This requirement does not apply to hazard tree removal and other public safety needs.	See; Vegetation section of the DEIS, p. 64.	
2.	Silvicultural examinations and prescriptions will be required prior to timber manipulation or silvicultural treatment. Exceptions are allowed for removal of trees that block vision along roads, removal of hazard trees, clearing of rights-of-way, clearing for mineral development, Christmas tree sales in encroachment areas, and removal of firewood.	Yes; Vegetation Report in the project file.	
Wildlife Habitat			
1.	From October 15 to December 1 Hunting Units that exceed the open motorized road and trail density objective will have no net increase in designated open motorized road and trail mileage (Scale – Hunting Units on National Forest lands).	N/A	The existing OMRTDs for Hunting Unit 212 meet Plan direction. Construction of temporary roads and use of existing closed roads would temporarily increase the OMRTD, but road densities in HU212 would remain below FP thresholds. These temporary roads would not be open to public use, roads in

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
			secure areas would not be used during the hunting season and would be obliterated or closed upon completion of harvest activities and there would be no net increase.
2.	Landscapes that exceed the open motorized road and trail objective will have no net increase in designated open motorized road and trail mileage (Scale – Landscapes on National Forest System Lands).	N/A	The existing OMRTDs for the Clark Fork-Flints landscape meet Forest Plan direction.
3.	Mechanical vegetation treatments will: Retain all snags greater than 20" d.b.h. (except for hazard trees). In addition, do not reduce the number of snags greater than 15.0" d.b.h. per acre in treatment units below the levels shown in the Table 12, calculated as an average for the total treatment unit acreage in a project area. This calculation allows variability among treatment units, which produces a more natural clumpy distribution. (See Forest Plan Chapter 3, p. 48). If there are insufficient snags in treatment units, live trees in the same size class must be retained and counted towards the snag requirement. These would be in addition to any requirements of Standard 4. These per acre requirements do not apply to the treatment units if analysis shows the levels of snags will be met for the project area as a whole. If, in the project area as a whole, there are insufficient live trees and/or snags greater than 15.0" d.b.h., the standard is deemed complied with by retention of the existing live trees and/or snags greater than 15.0" d.b.h. in the treatment units.	Yes; DEIS, pp. x and x.	

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
4.	Do not reduce the number of live trees greater than 10.0" d.b.h. per acre in regeneration harvest treatment units (to provide future snags) below the levels shown in Table 13 on the next page. (See Forest Plan Chapter 3, p. 49).	Yes; see Project Design Features And Mitigation Measures section, p. 43, and the Wildlife section of the DEIS, p. 143.	
5.	Sheep allotments in the Gravelly Landscape, which become vacant will be closed to sheep grazing or the vacant allotment may be used by an existing Gravelly Landscape sheep permittee, with no increase in permitted use (Scale – Gravelly Landscape).	N/A	The Flint Foothills Project is not addressing sheep allotments.
6.	The Grizzly Bear Amendment applies to only the Beaverhead-portion of the Forest and is incorporated as Appendix G (USDA Forest Service 2006b).	N/A	This only applies to the Beaverhead portion of the Forest
7.	The Northern Rockies Lynx Management Direction (2007) is included in Appendix G, and will apply to the Beaverhead- Deerlodge National Forest as described in the Northern Rockies Lynx Management Record of Decision.	Potentially No	Preliminary information suggests that treatment within four units under alternatives 2 and 3 may be inconsistent with Standard Veg S6. Further field review is needed to verify habitat conditions.

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
8.	Within 18 kilometers of documented active or inactive sage grouse leks, do not remove sagebrush within 300 meters of riparian zones, meadows, lakebeds or farmland, unless site-specific analysis indicates such removal promotes achievement of the sagebrush habitat goal. Springs developed for livestock water in these areas must be designed to maintain free water and wet meadows.	N/A	The Flint Foothills Project area is located more than 18 miles north of the nearest known sage grouse lek site and contains little or no suitable sage grouse habitat. This project would not remove sagebrush
9.	Mitigate, through avoidance or minimization, management actions around known active nest sites of threatened, endangered, proposed candidate, and sensitive bird species, if those actions would disrupt reproductive success during the nesting period. During project planning consider applicable science regarding species needs (such as nesting periods and buffers) and site-specific considerations. This standard also applies to Great Gray Owl and Northern Goshawk.	Yes; see Project Design Features and Mitigation Measures, chapter 2; the Wildlife section, and appendix x.	
10.	When closing entrances to abandoned mines, determine whether suitable habitat for bats exists, and where it does, provide access for bats.	N/A.	The Flint Foothills Project does not close abandoned mines.
11.	Implement the most current National Fish and Wildlife Service Terms and Conditions for wolves in the northwest Montana recovery area (west of I-15 and north of I-90) until such time as the gray wolf is delisted. (See Appendix I)	N/A.	Wildlife section of the DEIS. p. 190. Wolves in the Flint Foothills Project area were delisted on May 5, 2011. Terms and conditions do not apply.

Standard	Standard Description	Does the Proposed Action Meet the Standard? (Yes, No, N/A). If "Yes" include where supporting documentation is addressed.	If "No" or 'N/A" provide an explanation.
12.	Provide habitat for species requiring large woody debris in forested habitat types by retaining post project outcomes for regeneration harvest of the following: (Scale project) Lodgepole cover type-6 pieces/ac with small end diameter equal to or greater than 8 inches and 10-ft long. Douglas-fir cover type-6 pieces/ac with small end diameter equal to or greater than 12 inches and 10-ft long.	Yes; see project design features, and Wildlife section; DEIS, pp. 43. And 143.	

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Appendix D – Cumulative Effects Analysis

Cumulative Effects

Past Vegetation and Prescribed Fire Activities

The following discussion focuses on the past vegetation and prescribed fire activities in the Flint Foothills project area that contribute to the current condition. Figure D-1displays the past vegetation and prescribed fire activities that tie to the activities shown in table D-1.The Flint Foothills Project proposed action is also displayed to show the spatial relationship. Both the table and map reflect data at the 6th field HUC watershed level, which extends beyond the project area boundary. The past activities outside of the project boundary are not included in the cumulative effects analyses, unless indicated specifically in a resource section.

Timber Harvest

Timber harvest likely began in the project area in the 1870s, and increased primarily in support of mining activities in local areas such as the Rose Mine in the Dunkleberg drainage, with extensive logging occurring on National Forest lands from 1906 through 1917; this pattern was likely common on all lands within 50 miles of Butte and Anaconda (Losensky 1997). No data is available for the logging done during this time period.

The data record for timber harvest begins in the 1950s. There is no known record prior to that date. Where possible, the year of the timber sale termination date was used for the date of the activities in the tables below. However, timber sale activities for a given timber sale can span several years and may overlap into different decades. As with any record, there may be errors in recording; however, the data displayed below represents the current data record. A summary of harvest by decade is contained in the Vegetation section of the analysis.

The catalog of past projects in table D-1 is comprehensive based on information available to the Forest Service. However there may be some unintended omissions due to lack of current records or knowledge. Information on past activities was gathered from the Forest Service Activity Tracking System (FACTS), which is an activity tracking system for all levels of the Forest Service, District files, and collective knowledge of local Forest Service employees.

Precommercial Thinning

Precommercial thinning of past harvest units began in the 1960s with the objective to reduce stand densities and improve growing conditions for the retained trees. As with any record, there may be errors in recording; however, the data displayed below represents the current data record. A summary of prescribed fire by decade is contained in the Vegetation section of the analysis.

Prescribed Fire

The data record for prescribed fire begins in the 1950s. There is no known record prior to that date. Most of the early records of prescribed fire are associated with timber sale activities—the disposal of activity fuels left behind after logging. Some prescribed fire use has occurred to improve stand conditions for certain vegetation species, such as removing conifer succession in grassland areas. As with any record, there may be errors in recording; however, the data displayed below represents the current data record. A summary of prescribed fire by decade is contained in the beginning of chapter 3.

Table D- 1. Past Vegetation and prescribed fire activities within the 6th Code HUCs associated with the Flint Foothills project.

6th Code HUC, Decade, and Activity	Acres
Boulder Creek	**13879**
1950-1959	**1352**
Burning of Piled Material	137
Group Selection Cut (UA/RH/FH)	120
Overstory Removal Cut (from advanced regeneration) (EA/RH/FH)	15
Piling of Fuels, Hand or Machine	555
Single-tree Selection Cut (UA/RH/FH)	526
1960-1969	**1478**
Burning of Piled Material	671
Jackpot Burning - Scattered concentrations	65
Piling of Fuels, Hand or Machine	315
Precommercial Thin	28
Seed-tree Seed Cut (with and without leave trees) (EA/RH/NFH)	15
Single-tree Selection Cut (UA/RH/FH)	316
Stand Clearcut (EA/RH/FH)	68
1970-1979	**1607**
Burning of Piled Material	419
Commercial Thin	314
Piling of Fuels, Hand or Machine	419
Seed-tree Seed Cut (with and without leave trees) (EA/RH/NFH)	8
Single-tree Selection Cut (UA/RH/FH)	99
Stand Clearcut (EA/RH/FH)	350
1980-1989	**633**
Burning of Piled Material	170
Commercial Thin	112
Liberation Cut	12
Piling of Fuels, Hand or Machine	102
Precommercial Thin	86
Sanitation (salvage)	19
Seed-tree Seed Cut (with and without leave trees) (EA/RH/NFH)	28
Shelterwood Establishment Cut (with or without leave trees) (EA/RH/NFH)	75
Single-tree Selection Cut (UA/RH/FH)	29
1990-1999	**3924**
Burning of Piled Material	864
Commercial Thin	634
Improvement Cut	172
Jackpot Burning - Scattered concentrations	113
Patch Clearcut (EA/RH/FH)	29
Piling of Fuels, Hand or Machine	1529

6th Code HUC, Decade, and Activity	Acres
Sanitation (salvage)	215
Seed-tree cut (w/res) (EA/RN/NFH)	187
Special Cut	44
Stand Clearcut (EA/RH/FH)	0
Stand Clearcut (w/ leave trees) (EA/RH/FH)	136
2000-2009	**4847**
Broadcast Burning - Covers a majority of the unit	1012
Burning of Piled Material	1433
Commercial Thin	383
Improvement Cut	475
Jackpot Burning - Scattered concentrations	68
Piling of Fuels, Hand or Machine	1104
Seed-tree Seed Cut (with and without leave trees) (EA/RH/NFH)	3
Shelterwood cut (w/res) (EA/RN/NFH)	38
Special Cut	87
Stand Clearcut (w/ leave trees) (EA/RH/FH)	244
2010-pres*	**39**
Burning of Piled Material	39
Clark Fork River-Gold Creek	**27556**
1960-1969	**2694**
Broadcast Burning - Covers a majority of the unit	515
Burning of Piled Material	178
Piling of Fuels, Hand or Machine	178
Stand Clearcut (EA/RH/FH)	1797
Stand Clearcut (w/ leave trees) (EA/RH/FH)	26
1970-1979	**9331**
Burning of Piled Material	2659
Commercial Thin	70
Patch Clearcut (EA/RH/FH)	33
Piling of Fuels, Hand or Machine	3359
Seed-tree Seed Cut (with and without leave trees) (EA/RH/NFH)	181
Shelterwood Establishment Cut (with or without leave trees) (EA/RH/NFH)	654
Single-tree Selection Cut (UA/RH/FH)	4
Special Cut	4
Stand Clearcut (EA/RH/FH)	2340
Stand Clearcut (w/ leave trees) (EA/RH/FH)	26
1980-1989	**7261**
Burning of Piled Material	2111
Commercial Thin	1428
Liberation Cut	6

6th Code HUC, Decade, and Activity	Acres
Piling of Fuels, Hand or Machine	1876
Precommercial Thin	299
Sanitation (salvage)	365
Seed-tree Seed Cut (with and without leave trees) (EA/RH/NFH)	89
Shelterwood Establishment Cut (with or without leave trees) (EA/RH/NFH)	68
Shelterwood Preparatory Cut (EA/NRH/NFH)	6
Shelterwood Removal Cut (EA/NRH/FH)	140
Single-tree Selection Cut (UA/RH/FH)	642
Special Cut	41
Stand Clearcut (EA/RH/FH)	167
Stand Clearcut (w/ leave trees) (EA/RH/FH)	23
1990-1999	**5224**
Broadcast Burning - Covers a majority of the unit	152
Burning of Piled Material	1685
Commercial Thin	820
Improvement Cut	41
Liberation Cut	56
Piling of Fuels, Hand or Machine	1395
Precommercial Thin	410
Sanitation (salvage)	120
Seed-tree Seed Cut (with and without leave trees) (EA/RH/NFH)	130
Shelterwood Establishment Cut (with or without leave trees) (EA/RH/NFH)	144
Special Cut	27
Stand Clearcut (EA/RH/FH)	123
Stand Clearcut (w/ leave trees) (EA/RH/FH)	111
Wildlife Habitat Prescribed fire	12
2000-2009	**3037**
Broadcast Burning - Covers a majority of the unit	86
Burning of Piled Material	937
Commercial Thin	239
Improvement Cut	295
Piling of Fuels, Hand or Machine	692
Precommercial Thin	546
Seed-tree cut (w/res) (EA/RN/NFH)	31
Shelterwood Establishment Cut (with or without leave trees) (EA/RH/NFH)	139
Shelterwood Preparatory Cut (EA/NRH/NFH)	33
Stand Clearcut (w/ leave trees) (EA/RH/FH)	39
2010-present	**9**
Commercial Thin	7
Piling of Fuels, Hand or Machine	2

6th Code HUC, Decade, and Activity	Acres
Lower Flint Creek	**17379**
1950-1959	**192**
Piling of Fuels, Hand or Machine	96
Single-tree Selection Cut (UA/RH/FH)	96
1960-1969	**4658**
Broadcast Burning - Covers a majority of the unit	105
Burning of Piled Material	1063
Group Selection Cut (UA/RH/FH)	31
Jackpot Burning - Scattered concentrations	16
Piling of Fuels, Hand or Machine	1203
Seed-tree Preparatory Cut (EA/NRH/NFH)	21
Seed-tree Seed Cut (with and without leave trees) (EA/RH/NFH)	91
Shelterwood Establishment Cut (with or without leave trees) (EA/RH/NFH)	250
Single-tree Selection Cut (UA/RH/FH)	297
Stand Clearcut (EA/RH/FH)	1580
Stand Clearcut (w/ leave trees) (EA/RH/FH)	1
1970-1979	**6132**
Broadcast Burning - Covers a majority of the unit	132
Burning of Piled Material	1762
Commercial Thin	227
Group Selection Cut (UA/RH/FH)	126
Overstory Removal Cut (from advanced regeneration) (EA/RH/FH)	70
Piling of Fuels, Hand or Machine	1828
Precommercial Thin	271
Sanitation (salvage)	73
Shelterwood Establishment Cut (with or without leave trees) (EA/RH/NFH)	229
Single-tree Selection Cut (UA/RH/FH)	414
Stand Clearcut (EA/RH/FH)	906
Stand Clearcut (w/ leave trees) (EA/RH/FH)	94
1980-1989	**2798**
Broadcast Burning - Covers a majority of the unit	13
Burning of Piled Material	372
Commercial Thin	452
Liberation Cut	85
Piling of Fuels, Hand or Machine	587
Precommercial Thin	56
Sanitation (salvage)	19
Seed-tree Final Cut (EA/NRH/FH)	60
Seed-tree Seed Cut (with and without leave trees) (EA/RH/NFH)	250
Shelterwood Establishment Cut (with or without leave trees) (EA/RH/NFH)	49

6th Code HUC, Decade, and Activity	Acres
Shelterwood Removal Cut (EA/NRH/FH)	61
Special Cut	27
Stand Clearcut (EA/RH/FH)	754
Tree Release and Weed	13
1990-1999	**2381**
Burning of Piled Material	1395
Commercial Thin	9
Piling of Fuels, Hand or Machine	441
Precommercial Thin	65
Seed-tree Seed Cut (with and without leave trees) (EA/RH/NFH)	258
Shelterwood Removal Cut (EA/NRH/FH)	27
Special Cut	25
Stand Clearcut (EA/RH/FH)	69
Stand Clearcut (w/ leave trees) (EA/RH/FH)	92
2000-2009	**1163**
Broadcast Burning - Covers a majority of the unit	263
Burning of Piled Material	270
Commercial Thin	186
Improvement Cut	32
Piling of Fuels, Hand or Machine	253
Precommercial Thin	84
Shelterwood cut (w/res) (EA/RN/NFH)	75
2010-present	**55**
Piling of Fuels, Hand or Machine	55
Grand Total	**58814**

Present and Reasonably Foreseeable Actions

A discussion on cumulative effects and identification of the present and reasonably foreseeable actions relevant to the Flint Foothills analysis (table 23 in Volume 1) are provided in the introduction to chapter 3. The activities in table D- 1 are displayed at the project scale in figure D- 1. Figure D- 2 displays the information at a broader, landscape view and includes the proposed action. Figure D- 3 presents present and reasonably foreseeable activities at the landscape scale.

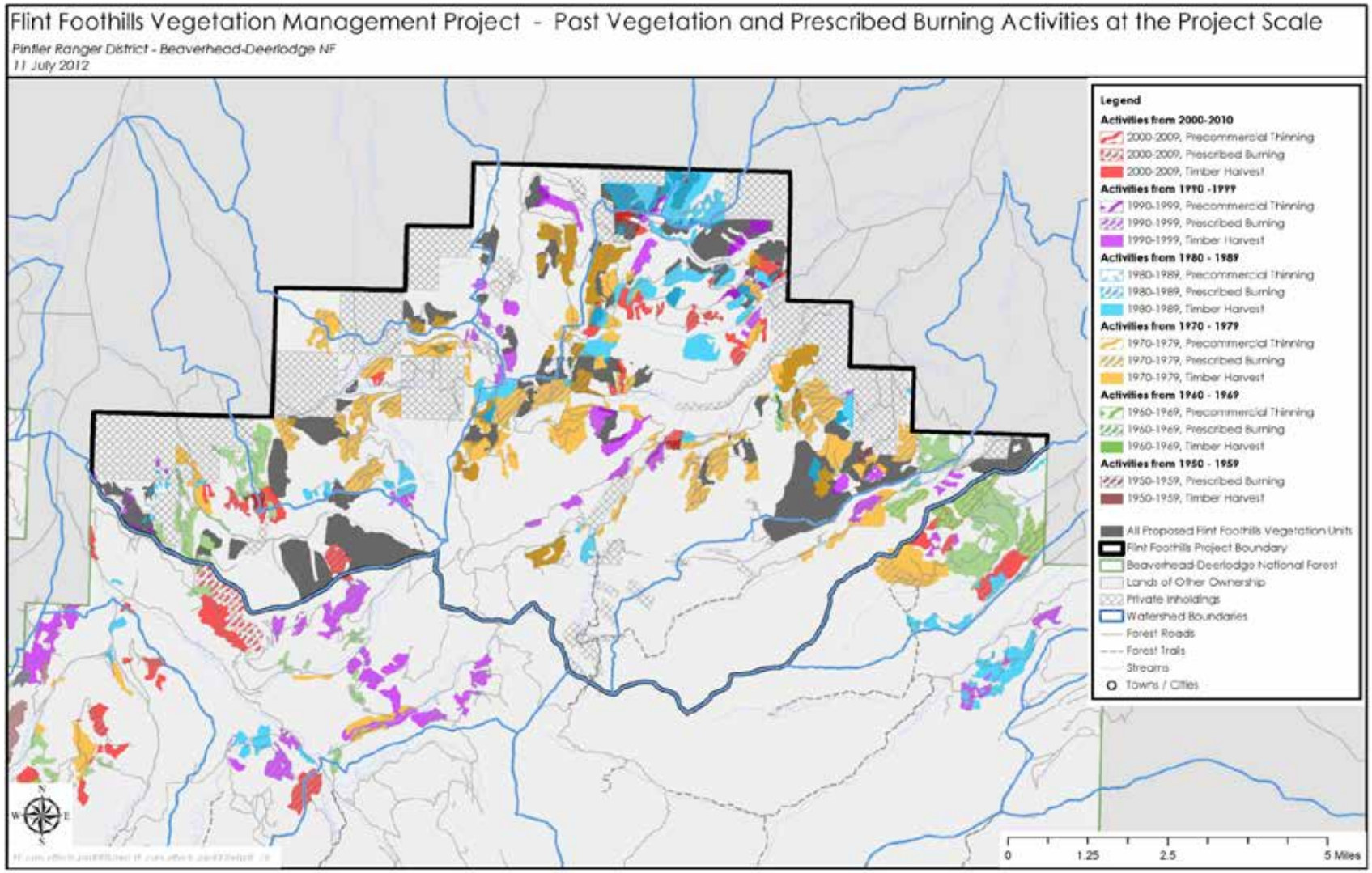

Figure D- 1. Past vegetation and prescribed burning activities at the project scale

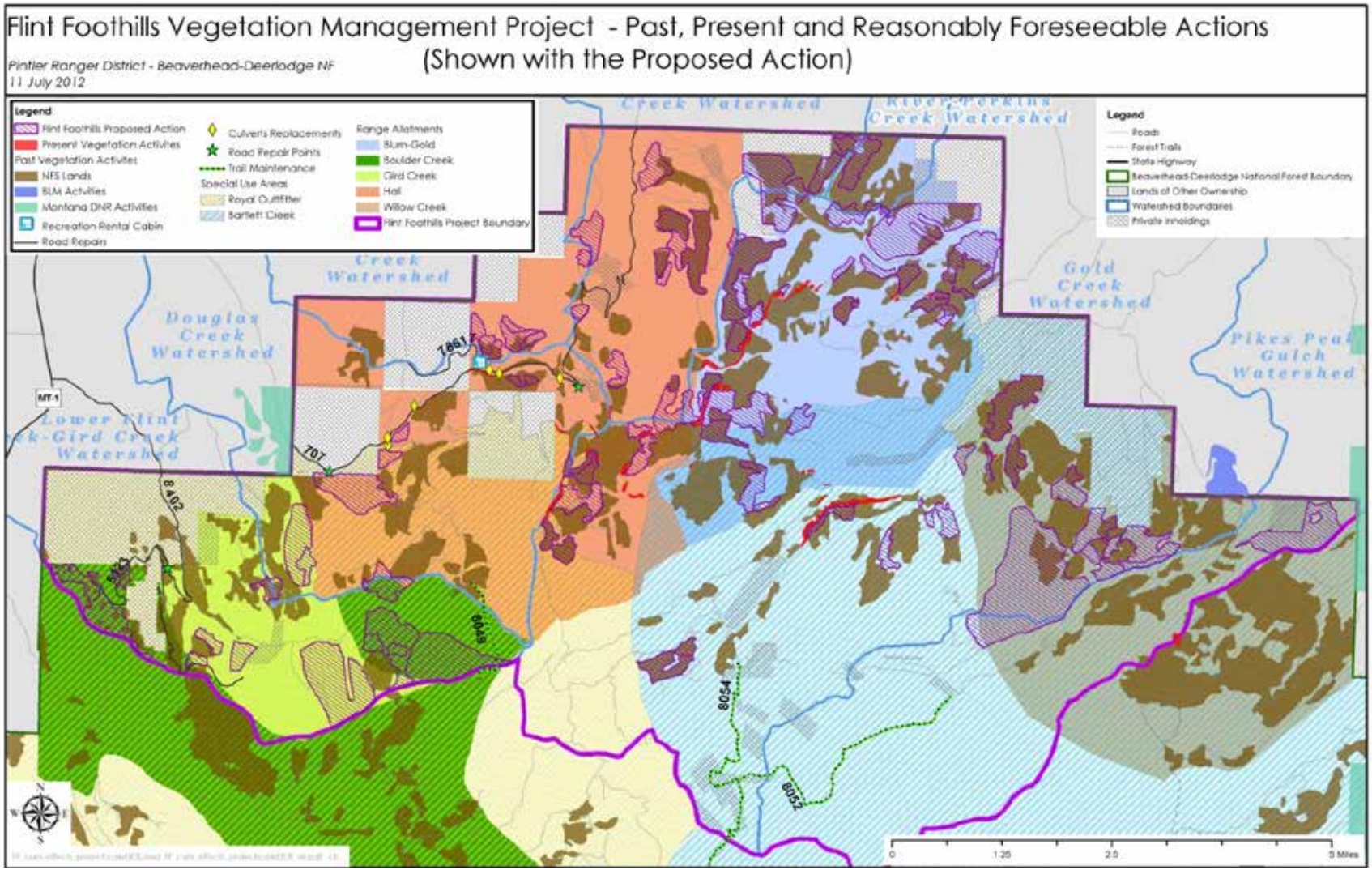

Figure D- 2. Past, present and reasonably foreseeable actions shown with the proposed action

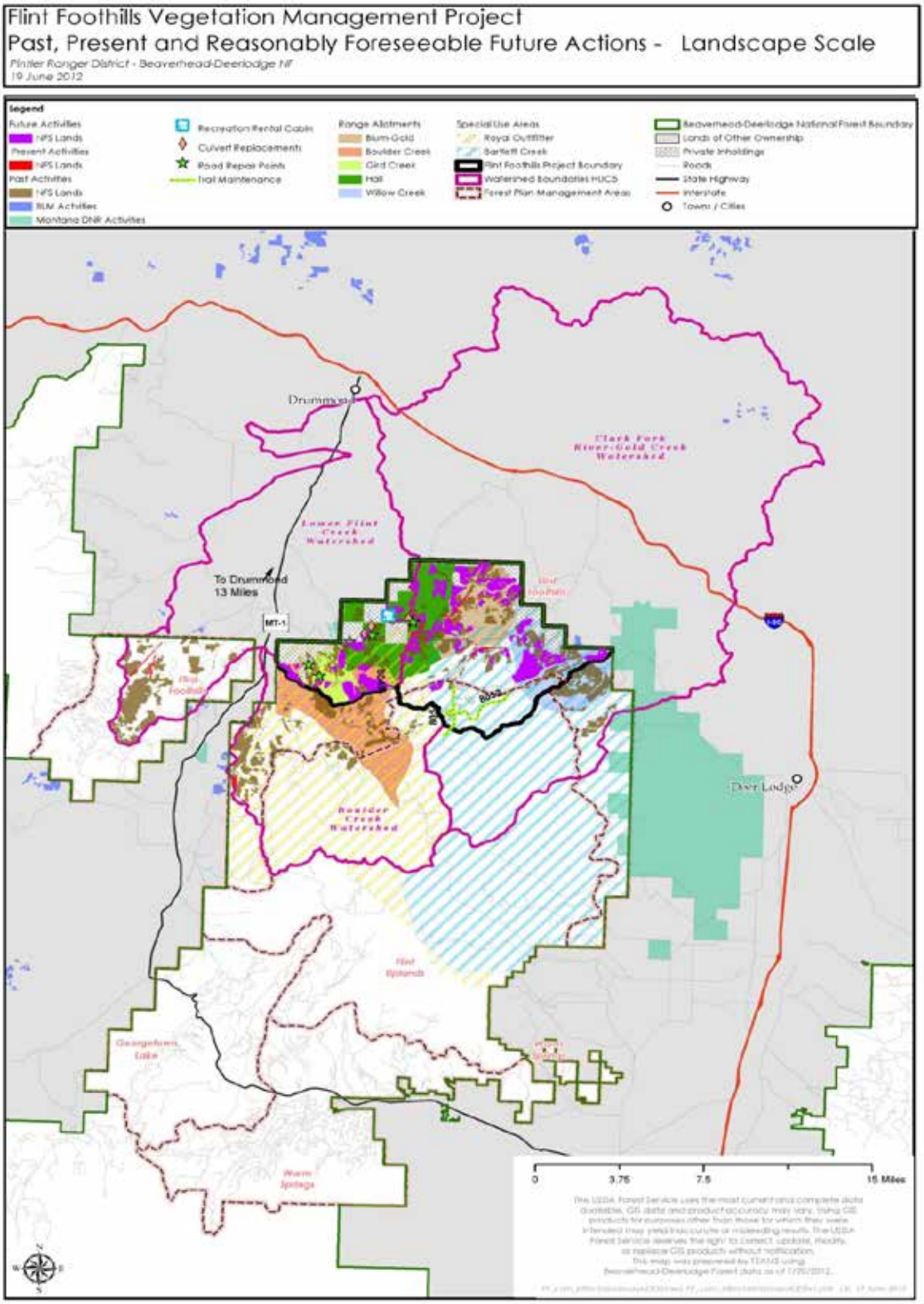

Figure D- 3. Past, present and reasonably foreseeable actions at the landscape scale

Appendix E – Vegetation Attributes

Attribute Tables in Order

Commercial Thinning – Douglas-fir and Ponderosa Pine

Seed Tree Harvest – Douglas-fir and Ponderosa Pine

Salvage by Clearcut – Dead and Dying Lodgepole Pine

Prescribed Burning

Table E- 1. Attribute summary of commercial thinning Douglas-fir and ponderosa pine stands

Unit #	Stand description	Acres
6C	Variable density DF stand; 120-180 BA. Some dead LP and minor component of aspen. Average age of stand 130 years old. Average age and diameter of trees to be left: ave age 170 yrs and 22 inches DBH. Stand contains old growth.	14
8C	Variable density DF stands; 160-240 BA; 20-40% LP; ave age: 120 years.	13
10C	Density varies from 140 to 180 BA. Scattered old trees; ave stand age 120 years.	31
11C	Ave age: 120 years; ave density 120 BA. 20-40% LP and 40-60% DF. >60% LP dead	17
12C	Ave age: 110 years; density from 160-210 BA. 60% LP 40% DF >60% LP dead	33
20C	Variable densities DF stand with some LP. Ave age: 125, with few scattered old trees (about 1 every 2 acres). Ave density is 120-180 BA. Some aspen.	64
22C	Ave age 125 years, with variable BA from 120 to 160. Some aspen.	16
23C	Density varies from 80 to 180 BA. Numerous aspen clones, some LP. Scattered old trees; ave stand age 120 years. Old growth component 180+ yrs. 60-80% DF 20-40% PP mixed.	69
24C	Variable density DF stand with some LP. Ave age: 125, with few scattered old trees (about 1 every 2 acres). Ave density is 120-180 BA. Some aspen.	14
25C	Ave age: 120 years, with ave density 80-140 BA. Contains old growth DF/PP 200+ yrs. in pockets on NE end of proposed unit.	5
28C	Ave age: 120 years, with ave density 60-160 BA. Mainly DF 60-90% variable with LP and a small component of ES.	6
29C	Ave age: 120 years, with ave density 60-180 BA. Mainly DF 60-80% variable with LP.	6
31C	Density from 80-180 BA, with ave age ranging between 80-120 years old. Small component of LP and ES. Majority over 80% being DF.	24
33C	Density from 80-180 BA, with ave age ranging between 80-120 years old. Small component of LP and ES. Majority over 80% being DF.	26
42C	Density from 80-120 BA, with ave age ranging between 80-120 years old. DF averaging 30-60% and LP 40-60% being variable across the harvest unit.	31
48C	Density from 120-210 BA, with ave age ranging between 80-120 years old. DF is 30-40% with LP 40-60% with some ES and aspen.	157
55C	Density from 80-180 BA, with ave age ranging between 80-120 years old. Small component of LP and ES. Majority over 80% being DF. Northeast ½ of harvest unit contains old growth as displayed on map. Old growth ave DBH is 18 inches with largest tree 31 inches; age ranges between 180-300 yrs old.	175
56C	Density from 80-140 BA, with ave age ranging between 80-120 years old. Small component of LP and ES. Majority over 80+% being DF.	18
57C	Density from 80-140 BA, with ave age ranging between 80-120 years old. Small component of PP. Majority mixed with 30-40% LP and 40-60% being DF.	27
59C	Density from 80-140 BA, with ave age ranging between 80-120 years old. Small	20

Unit #	Stand description	Acres
	component of LP and ES. Majority over 90+% being DF. Ave DBH is roughly 9 inches.	
60C	Density from 80-140 BA, with ave age ranging between 80-120 years old. Small component of LP and ES. Majority over 90+% being DF. Ave DBH is about 9 inches. Retention trees are 15+ inch DBH DF at about a BA of 40-50.	14
64C	Density from 80-140 BA, with ave age ranging between 80-140 years old. Small component of LP and ES. Majority over 90% being DF. PP makes up less than 10%.	25
65C	Density from 80-140 BA, with ave age ranging between 80-120 years old. Small component of LP and ES. Majority over 90+% being DF.	18
66C	Density from 80-140 BA, with ave age ranging between 80-120 years old. Component 30-40% of LP. 60 +% being DF.	24
67C	Density from 80-180 BA, with ave age ranging between 80-120 years old. Component of LP 40-70% and 30-50% being DF. Ave DBH is roughly 9 inches.	33
68C	Density from 80-140 BA, with ave age ranging between 80-120 years old. Small component of LP and ES. Majority over 90+% being DF.	38
71C	Density from 80-120 BA, with ave age ranging between 80-120 years old. Small component of LP and ES. Majority over 90+% being DF. Ave DBH is roughly 9 inches.	122
80C	Density from 180-220 BA, with ave age ranging between 80-120 years old. Small component of LP and ES. Majority over 90+% being DF. Ave DBH is roughly 9 inches.	31
81C	Density from 80-180 BA, with ave age ranging between 80-120 years old. Small component of LP and ES. Majority over 90+% being DF. 1-2 tpa of remnant DF.	9
	Total acres of commercial DF thin	**1,149**

DF: Douglas-fir
PP: ponderosa pine
LP: lodgepole pine
ES: Engelmann spruce
TPA: trees per acre
BA: basal area

Table E- 2. Attribute summary of seed tree harvest in Douglas-fir and ponderosa pine stands

Unit #	Stand description	Acres
1ST	Density from 40-120 BA, with ave age ranging between 80-120 years old. Small component of PP 10% and LP 1%. Majority over 90+% being DF.	102
5ST	Density from 80-120 BA, with ave age ranging between 80-120 years old. Majority over 90+% being DF.	47
27ST	Density from 40-140 BA, with ave age ranging between 80-120 years old. Small component of PP. Majority over 90+% being DF. Aspen clones exist and are vigorous. Minor component of remnant DF and PP exist.	139
30ST	Density from 80-140 BA, with ave age ranging between 80-120 years old. Small component of LP and ES. Majority over 90+% being DF.	39
32ST	Density from 80-220 BA, with ave age ranging between 80-120 years old. Small component of LP. Majority over 90+% being DF.	18
65ST	Density from 60-120 BA, with ave age ranging between 80-160 years old. Small component of PP 20%. Majority over 70+% being DF.	8
	Total acres of seed tree harvest with reserve trees	**353**

DF: Douglas-fir
PP: ponderosa pine
LP: lodgepole pine
ES: Engelmann spruce
TPA: trees per acre
BA: basal area

Table E- 3. Salvage by clearcut lodgepole pine stands (all lodgepole over 5 inches diameter removed)

Unit #	Stand description	Vegetation Category/Snags	Acres
16S	Retain DF and aspen. No exam data available for this unit. Informal walk through exams show small amount of DF.	Warm vegetation type: Trees >15” diameter unknown	7
19S	Retain DF and aspen. No exam data available for this unit. Informal walk through exams show small amount of DF 10-20 BA 15+ inches.	Warm vegetation type: Trees >15” diameter unknown	41
26S	Retain DF and aspen. No exam data available for this unit. Informal walk through exams show small amount of DF.	Warm vegetation type: Trees >15” diameter unknown	25
34S	Retain DF and aspen. No exam data available for this unit. Informal walk through exams show 15-25% DF in overstory.	Warm vegetation type: Trees >15” diameter unknown	78
35S	Retain DF/AF and aspen. There are 23 live DF/ES leave trees per acre that are 10+ inches in diameter.	Warm vegetation type: 23 live trees 10”+, No trees >15”	50
36S	Retain DF/AF and aspen. There are 112 live AF/ES leave trees per acre that average 8.7 inches in diameter.	Cool vegetation type: 28 live trees 10”+ 24 dead trees 15”+	61
37S	Retain DF and aspen. No exam data available for this unit. Informal walk through exams show small amount of DF.	Warm vegetation type: Trees >15” diameter unknown	8
39S	Retain DF and aspen. No exam data available for this unit.	Warm vegetation type: Trees >15” diameter unknown	79
40S	Retain DF/AF and aspen. There are 160 live AF leave trees per acre that average 7.3 inches in diameter.	Cool vegetation type: 6 live trees 10”+ 11 live or dead trees 15”+	29
41S	Retain DF and aspen. No exam data available for this unit. Informal walk through exams show small amount of DF.	Warm vegetation type: Trees >15” diameter unknown	4
43S	Retain DF and aspen. No exam data available for this unit. Informal walk through exams show small amount of DF.	Warm vegetation type: Trees >15” diameter unknown	11
44S	Retain AF/ES and aspen. There are 92 live AF/ES leave trees per acre that average 5.8 inches in diameter. Small diameter stand.	Cool vegetation type: No live trees >10”; No >15” trees	31
45S	Retain DF/AF and aspen. There are 20 live AF leave trees per acre that average 4 inches in diameter.	Cool vegetation type: 6 live trees 10”+ 3 dead trees 15”+	31
46S	Retain DF and aspen. There are 128 live DF leave trees per acre that average 10.2 inches in diameter.	Warm vegetation type: 128 live trees 10”+ 2 dead trees 15”+	79
47S	Retain AF/WBP and aspen. No exam data available for this unit. Informal walk through exams show small amount of AF/WBP.	Warm vegetation type: Trees >15” diameter unknown	13
49S	Retain AF/ES and aspen. There are 91 live AF/ES leave trees per acre that average 7.8 inches in diameter.	Cool vegetation type: 54 live trees 10”+ 4 live and dead trees 15”+	43

Unit #	Stand description	Vegetation Category/Snags	Acres
50S	Retain DF and aspen. There are 4 live DF leave trees per acre that average 14.0 inches in diameter.	Warm vegetation type: 4 live trees 10”+ 6 dead trees 15”+	17
51S	Retain DF and aspen. No exam data available for this unit. Informal walk through exams show small amount of DF.	Warm vegetation type: Trees >15” diameter unknown	19
52S	Retain DF and aspen. No exam data available for this unit. Informal walk through exams show small amount of DF.	Warm vegetation type: Trees >15” diameter unknown	94
58S	Retain subalpine fir and spruce. No exam data available for this unit. Informal walk through exams show small amount of fir and spruce.	Cool vegetation type: Trees >15” diameter unknown	49
61S	Retain DF. There are 17 live DF leave trees per acre that average 14.5 inches in diameter.	Warm vegetation type: 17 live trees 10”+ 5 live and dead trees 15”+	88
62S	Retain DF. There are 84 live DF leave trees per acre that average 9.1 inches in diameter.	Warm vegetation type: 32 live trees 10”+	36
69S	Retain DF and aspen. No exam data available for this unit. Informal walk through exams show small amount of DF.	Warm vegetation type: Trees >15” diameter unknown	2
72S	Retain DF and aspen. No exam data available for this unit. Informal walk through exams show small amount of DF.	Warm vegetation type: Trees >15” diameter unknown	28
73S	Retain DF and aspen. No exam data available for this unit. Informal walk through exams show small amount of DF.	Warm vegetation type: Trees >15” diameter unknown	64
74S	Retain DF and aspen. No exam data available for this unit. Informal walk through exams show small amount of DF.	Warm vegetation type: Trees >15” diameter unknown	74
76S	Retain DF and aspen. No exam data available for this unit. Informal walk through exams show small amount of DF.	Warm vegetation type: Trees >15” diameter unknown	32
77S	Retain DF and aspen. No exam data available for this unit. Informal walk through exams show small amount of DF.	Warm vegetation type: Trees >15” diameter unknown	16
78S	Retain DF and aspen. No exam data available for this unit. Informal walk through exams show small amount of DF.	Warm vegetation type: Trees >15” diameter unknown	23
79S	Retain subalpine fir and spruce. No exam data available for this unit. Informal walk through exams show small amount of fir and spruce.	Cool vegetation type: Trees >15” diameter unknown	31
		Total acres of salvage clearcut of dead and dying lodgepole pine	**1,163**

DF: Douglas-fir
PP: ponderosa pine
LP: lodgepole pine
ES: Engelmann spruce
TPA: trees per acre
BA: basal area

Table E- 4. Prescribed burning unit description

Unit	Unit description	Acres
1B	Low elevation, dry forest, mostly DF with some PP and dead LP. Multi-layered with dense pockets of understory.	22
2B	Low elevation, dry forest, mostly DF with some PP, juniper and dead LP. Multi-layered with dense pockets of understory. DF defoliated by spruce budworm.	15
3B	Mid elevation, mixed conifer with mostly LP with DF; LP is dead and dying. Some spruce and aspen.	298
4B	Mid elevation, mixed conifer with mostly LP with DF; LP is dead and dying. Some spruce and aspen.	251
5B	Mid elevation, mixed conifer with mostly LP with DF; LP is dead and dying. Some WBP, spruce, subalpine fir and aspen. Most WBP occurs at upper end of unit in pockets, mostly dead from MPB, with WBP naturally regenerating in openings created by dead trees.	710
6B	Low elevation, dry forest, mostly DF with some PP, juniper and dead LP. Multi-layered with dense pockets of understory. DF defoliated by spruce budworm.	164
7B	Low elevation, dry forest with some grassy openings, mostly DF with some PP, juniper and dead LP. Multi-layered with dense pockets of understory. DF defoliated by spruce budworm.	298
8B	Low elevation, dry forest, mostly DF with some PP, juniper and dead LP. Multi-layered with dense pockets of understory. DF defoliated by spruce budworm.	232
	Total acres of prescribed burning treatments	**1,990**

DF: Douglas-fir
PP: ponderosa pine
LP: lodgepole pine
ES: Engelmann spruce
TPA: trees per acre
BA: basal area

Appendix F – Wildlife

Wildlife Considerations for Treatment Units

Table F- 1. Wildlife considerations for treatment units in the Flint Foothill Project

Unit Number	Unit within Travel Mgmt Area Closure	Haul/Access Roads with Travel Mgmt Restriction (Road ID)	Travel Mgmt Restriction Period	Raptor Nesting Restriction	Raptor Nesting Restriction Period	Comments
Proposed Salvage Units						
16S	X	78464	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
19S	X	73549	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
26S	X		Oct. 15 – Dec. 2			Haul unrestricted on 1544 Wildlife secure area Oct. 15 – Dec. 2
34S		78461	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
35S						Wildlife secure area Oct. 15 – Dec. 2
36S						Wildlife secure area Oct. 15 – Dec. 2
37S						
39S		5153, 78469, 78470	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
40S		5153	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
41S	X	UR8-257 (year round)	Oct. 15 – Dec. 2, Apr. 1 – June 15			Haul unrestricted on Rd 1557 Wildlife secure area Oct. 15 – Dec. 2

Unit Number	Unit within Travel Mgmt Area Closure	Haul/Access Roads with Travel Mgmt Restriction (Road ID)	Travel Mgmt Restriction Period	Raptor Nesting Restriction	Raptor Nesting Restriction Period	Comments
43S		5151	Year Round	Goshawk	Apr. 15 - Aug. 15	
44S		78472, 78475	Year Round			Wildlife secure area Oct. 15 – Dec. 2
45S		19755	Year Round			Haul unrestricted on Rd 636 Wildlife secure area Oct. 15 – Dec. 2
46S		1550, 78494	Oct. 15 – Dec. 2			Wildlife secure area Oct. 15 – Dec. 2
47S						Wildlife secure area Oct. 15 – Dec. 2
49S				Great gray owls	Mar. 15 - July 15	
50S	X		Oct. 15 – Dec. 2, Apr. 1 – June 15			Haul unrestricted on Rd 1544 Wildlife secure area Oct. 15 – Dec. 2
51S						
52S						
58S		78472, 78476	Year Round			Wildlife secure area Oct. 15 – Dec. 2
61S	X	78464	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
62S		5152	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
69S		19752	Year Round			Wildlife secure area Oct. 15 – Dec. 2
72S		8454	Oct. 15 – Dec. 2			Wildlife secure area

Unit Number	Unit within Travel Mgmt Area Closure	Haul/Access Roads with Travel Mgmt Restriction (Road ID)	Travel Mgmt Restriction Period	Raptor Nesting Restriction	Raptor Nesting Restriction Period	Comments
						Oct. 15 – Dec. 2
73S						
74S						
76S	X		Oct. 15 – Dec. 2			Haul unrestricted from Rd 1544 Wildlife secure area Oct. 15 – Dec. 2
77S		(UR8-284 year round); 1500	Sept. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
78S		(UR8-284 year round); 1500	Sept. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
79S						
Proposed Commercial Thinning Units						
6C	X	5023	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
8C	X	5023	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
10C	X		Oct. 15 – Dec. 2, Apr. 1 – June 15	Great Gray Owls	Mar. 15 - July 15	Haul unrestricted on Rd 1557 Wildlife secure area Oct. 15 – Dec. 2
11C	X	5023	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
12C	X	5023	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2

Unit Number	Unit within Travel Mgmt Area Closure	Haul/Access Roads with Travel Mgmt Restriction (Road ID)	Travel Mgmt Restriction Period	Raptor Nesting Restriction	Raptor Nesting Restriction Period	Comments
20C	X	8510	Oct. 15 – Dec. 2, Apr. 1 – June 15	Flammulated owls	May 15-August 15	Wildlife secure area Oct. 15 – Dec. 2
22C	X		Oct. 15-June 15			Haul unrestricted on Rd 707 Wildlife secure area Oct. 15 – Dec. 2
23C	X	5023	Oct. 15 – Dec. 2, Apr. 1 – June 15	Flammulated owls	May 15-August 15	Wildlife secure area Oct. 15 – Dec. 2
24C	X	8510	Oct. 15 – Dec. 2, Apr. 1 – June 15	Flammulated owls	May 15-August 15	Wildlife secure area Oct. 15 – Dec. 2
25C	X	78480	Oct. 15 – Dec. 2, Apr. 1 – June 15	Flammulated owls	May 15-August 15	Wildlife secure area Oct. 15 – Dec. 2
28C	X	78434	Oct. 15-June 15			Wildlife secure area Oct. 15 – Dec. 2
29C	X	78434	Oct. 15-June 15			Wildlife secure area Oct. 15 – Dec. 2
31C	X	78434	Oct. 15-June 15			Wildlife secure area Oct. 15 – Dec. 2
33C	X	78434	Oct. 15-June 15			Wildlife secure area Oct. 15 – Dec. 2
42C	X	78434	Oct. 15-June 15			Wildlife secure area Oct. 15 – Dec. 2
48C		(UR8-284 year round);1500	Sept. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
55C	X	5123	Oct. 15-June 15	Great gray owls	Mar. 15 - July 15	Wildlife secure area Oct. 15 – Dec. 2
56C		5123	Oct. 15-June 15	Goshawks	Apr. 15 - Aug. 15	Wildlife secure area Oct. 15 – Dec. 2

Unit Number	Unit within Travel Mgmt Area Closure	Haul/Access Roads with Travel Mgmt Restriction (Road ID)	Travel Mgmt Restriction Period	Raptor Nesting Restriction	Raptor Nesting Restriction Period	Comments
57C		5123	Oct. 15-June 15	Goshawks	Apr. 15 - Aug. 15	Wildlife secure area Oct. 15 – Dec. 2
59C	X	5123	Oct. 15-June 15	Great gray owls	Mar. 15 - July 15	Wildlife secure area Oct. 15 – Dec. 2
60C	X					Haul unrestricted on Rd 1557 Wildlife secure area Oct. 15 – Dec. 2
64C		5151	Year Round			Wildlife secure area Oct. 15 – Dec. 2
65C						
66C						
67C		78489; 8454	Oct. 15-June 15			Wildlife secure area Oct. 15 – Dec. 2
68C		666	Oct. 15-June 15	Goshawks	Apr. 15 - Aug. 15	Wildlife secure area Oct. 15 – Dec. 2
71C		8454	Oct. 15-June 15			Wildlife secure area Oct. 15 – Dec. 2
80C		5151	Year Round			Wildlife secure area Oct. 15 – Dec. 2
81C		5151	Year Round			Wildlife secure area Oct. 15 – Dec. 2
Seed Tree Units						
1ST	X	78480, 8615	Oct. 15 – Dec. 2, Apr. 1 – June 15	Great gray owl	Mar. 15 - July 15	Wildlife secure area Oct. 15 – Dec. 2
1ST	X			Flammulated owl	May 15-Aug. 15	
5ST	X	8615	Oct. 15 – Dec. 2,			Wildlife secure area

Unit Number	Unit within Travel Mgmt Area Closure	Haul/Access Roads with Travel Mgmt Restriction (Road ID)	Travel Mgmt Restriction Period	Raptor Nesting Restriction	Raptor Nesting Restriction Period	Comments
			Apr. 1 – June 15			Oct. 15 – Dec. 2
27ST	X	1522, 1522A, 5162, UR8-9020	Oct. 15 – Dec. 2, Apr. 1 – June 15	Goshawks	Apr. 15 - Aug. 15	Wildlife secure area Oct. 15 – Dec. 2
30ST	X	78434	Oct. 15-June 15			Wildlife secure area Oct. 15 – Dec. 2
32ST	X	78434	Oct. 15-June 15			Wildlife secure area Oct. 15 – Dec. 2
65ST		5152	Year Round			Haul unrestricted on Rd 1544
Proposed Precommercial Thinning Treatments						
1P	X	5023, 8506	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
2P	X	5023, 8615, 78479	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
8P	X	78495, 78585	Oct. 15 – June 15			
9P	X	78464	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
10P						Wildlife secure area Oct. 15 – Dec. 2
13P						
14P						
16P		5153	Oct. 15 – Dec. 2, Apr. 1 – June 15			

Unit Number	Unit within Travel Mgmt Area Closure	Haul/Access Roads with Travel Mgmt Restriction (Road ID)	Travel Mgmt Restriction Period	Raptor Nesting Restriction	Raptor Nesting Restriction Period	Comments
17P		5153	Oct. 15 – Dec. 2, Apr. 1 – June 15			
18P						Wildlife secure area Oct. 15 – Dec. 2
19P						Wildlife secure area Oct. 15 – Dec. 2
20P						
21P		78461	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
23P	X	78437	Oct. 15 – Dec. 2, Apr. 1 – June 15			Unit portion west of Rd 645 outside area closure; Access on Rd 645 unrestricted Wildlife secure area Oct. 15 – Dec. 2
25P	X	5153; 78469	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
36P						
39P						
41P	X	5023	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
42P	X	5023	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
45P		5153	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
Proposed Prescribed Burning						

Unit Number	Unit within Travel Mgmt Area Closure	Haul/Access Roads with Travel Mgmt Restriction (Road ID)	Travel Mgmt Restriction Period	Raptor Nesting Restriction	Raptor Nesting Restriction Period	Comments
Treatments						
1B (Low)						
2B (Low)						
3B (Mid)		666, 78608	Oct. 15 – Dec. 2, Apr. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
3B (Mid)		1500	Sept. 1 – June 15			
4B (Mid)		1500	Sept. 1 – June 15			Wildlife secure area Oct. 15 – Dec. 2
5B (Mid)						Wildlife secure area Oct. 15 – Dec. 2
6B (Low)						Wildlife secure area Oct. 15 – Dec. 2
7B (Low)	X	5162	Oct. 15 – Dec. 2			Wildlife secure area Oct. 15 – Dec. 2
8B (Low)	X	5161	Oct. 15 – Dec. 2			Wildlife secure area Oct. 15 – Dec. 2

Dates for LOP – hunting season 10/15 – 12/2 (Forest Travel map); winter range 12/2 – 5/15 (Forest Travel map); goshawk breeding season – 4/15 – 8/15 (USFWS R6 FWS, 2007); great gray owl breeding season 3/15 – 7/15; flammulated owl breeding season 5/15-8/15.

Wildlife Surveys

Surveys were done by Forest Service personnel across the project area, focusing on areas with proposed treatments and areas of suitable habitat based on species-specific habitat requirements. For example, flammulated owl surveys focused on areas proposed for treatment that included mature Douglas-fir; great gray owl surveys focused on units adjacent to open areas (meadows etc.); and goshawk surveys on historic nest sites. Attempts were made to follow up on reported raptor sightings; however these were often too late in the season to adequately survey, so special mitigation was included for those units (Wildlife project design features and mitigation measures, chapter 2).

Summer 2010

Black-backed woodpecker surveys

6-22-10: Units 15, 16 and 35. Detected three-toed woodpeckers in Unit 35. Units 10 and 11, drumming heard in both units but no visual for identification.

6-23-10: Unit 45. No woodpeckers noted. Unit 36, hairy woodpecker seen. Also did short survey to follow up on potential sighting north of unit 65 along Rd 5131. Only flickers detected.

7-1-10: units 27 and 43. Flicker, hairy woodpecker and sapsuckers seen.

Northern goshawk Surveys

7-1-10: Units 27 and 43. No goshawks detected.

7-13-10: Historic nest site survey, Emery Ridge. No goshawks detected.

7-14-10: Historic nest site survey, Crevice Creek. No goshawks detected.

7-14-10: Historic nest site survey, Blum Creek. No goshawks, but a pair of vocal red-tailed hawks detected.

7-15-10: Historic nest site survey, section 18. No goshawks detected.

7-20-10: Historic nest site survey, Gird Creek. Goshawk flew in, but nest not found.

7-20-10: Historic nest site survey, sec 6. Goshawk flew in, but nest not found.

7-21-10: Historic nest site survey, Dunkleberg. No goshawks detected.

7-21-10: Historic nest site survey, Forest Rose Mine. No goshawks detected.

Flammulated owl Surveys

6-14-10: Unit 1. Flam heard from second survey point. It was to the north, outside of the unit, and likely on adjacent private land.

6-14-10: Unit 25. Heard a great-horned and potential flam. Weathered out.

6-22-10: Unit 1. No flams but did see a great gray owl before dark. Attempted nest search but did not locate a nest.

6-22-10: Units 2-4. No flams detected.

6-23-10: Unit 27. No flams heard, one great-horned owl heard towards north end of unit.

6-23-10: Unit 25. Heard great gray owls and one long-eared owl. Not seen.

Summer 2011

Northern goshawk Surveys

7/19/2011. Dunkleberg historic nest revisit. Nest not used this year.

7/21/2011. Pioneer Gulch historic nest revisit. Nest not used this year.

8/2/2011. Follow up on reported goshawk sighting on Gird Creek Road (unit 68s accessed by this road). Goshawk nest found.

Flammulated owl Surveys

6/11/2011. Unit 01c. Flammulated owl survey, no responses.

7/12/2011. Unit 25c. Flammulated owl survey, flammulated and great gray owls seen.

7/13/2011. Unit 63c. Flammulated owl survey, no owls detected. Unit dropped.

7/13/2011. Unit 05c. Flammulated owl survey, no owls detected.

7/14/2011. Unit 20c/24c. Great gray owl and Flammulated owl surveys, no owls detected.

7/19/2011. Unit 20c/24c. Flammulated owl survey. Heard flammulated and great gray owls.

7/20/2011. Unit 20c. Flammulated owl survey, heard flammulated owls.

7/21/2011. Unit 23. Flammulated owl survey, heard flammulated owls.

7/26/2011. Unit 24c. Flammulated owl survey, could hear flamm from unit 20c.

7/26/2011. Unit 25c. Flammulated owl survey, heard flammulated owls.

7/27/2011. Unit 23c. Flammulated owl survey, heard flammulated owls.

Great gray owl Surveys

7/11/2011. Unit 01c. Great gray owl survey, no owls detected.

7/12/2011. Unit 05c. Great gray owl survey, no owls detected (did see three toed woodpecker)

7/14/2011. Unit 20c/24c. Great gray owl and Flammulated owl surveys, no owls detected.

7/18/2011. Unit 55c/59c. Great gray owl survey, unidentified owl seen, also pileated woodpecker

8/30/2011. Great gray owl seen in unit 10s. Confirmed by photos, too late in season for nest search.

9/8/2011. Adult and one fledged great gray owls (2 total) seen in unit 49S. Confirmed by photos. Too late in season for nest search.

Winter Nonmotorized Areas

The figure below displays the winter nonmotorized areas within the project area.

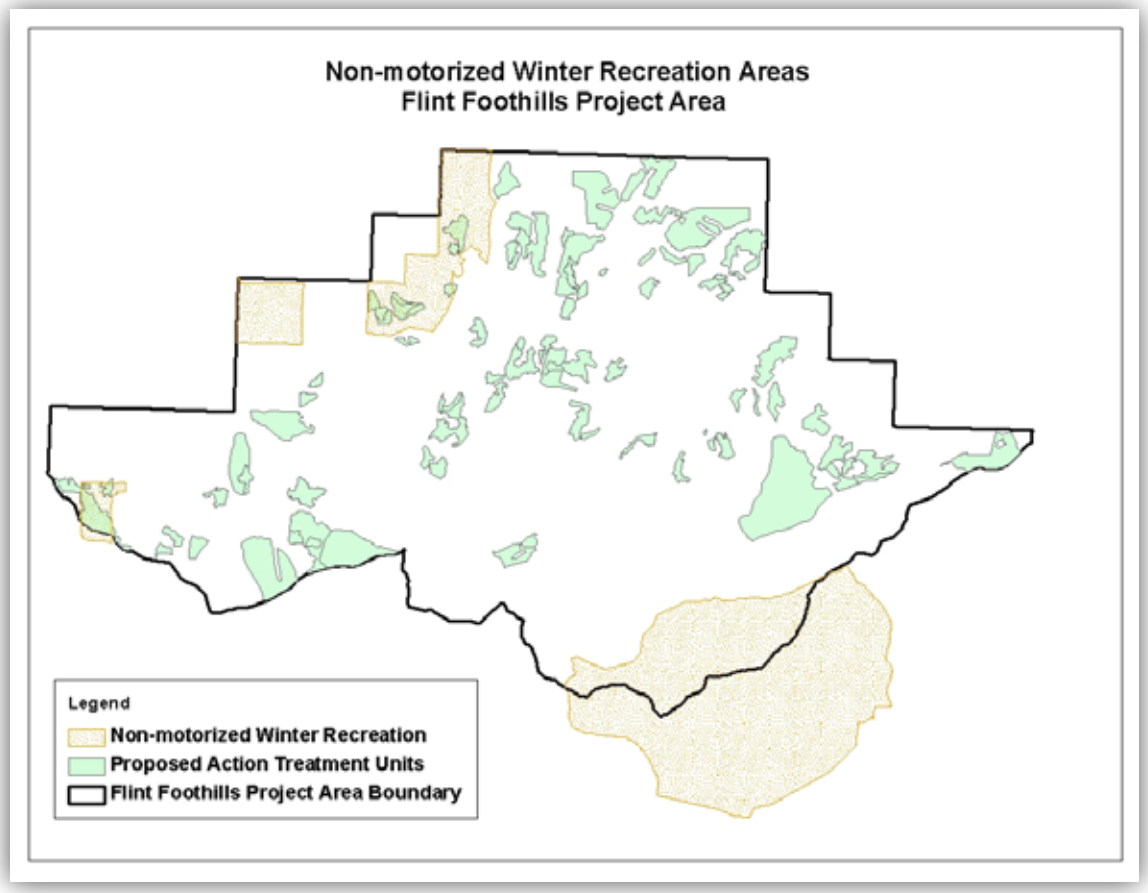

Figure F- 1. Nonmotorized winter recreation areas and proposed treatment units in the project area

Forest Plan TES Bird Nest Standard

Available references were reviewed to establish baseline limited operating periods and nest buffers. Site-specific conditions may warrant some deviation, but this provides a common starting point. When delineating a nest buffer on the ground, criteria that might be considered includes; homogeneity in the surrounding vegetation (species, age, size class etc.), the distance of the nest tree to motorized use or project activities, aspect and terrain of the stand; depending on the specific species being considered.

Table F- 2. Timing and nest buffers for TES active nests

Species	Breeding Season Limited Operating Period	Nest buffer
Flammulated owl	5/15 – 8/15	35 acres
Bald eagle	2/1 – 8/15	¼ mile visual buffer ½ mile in the absence of a visual buffer
Peregrine falcon	4/1 – 7/31	½ mile
Black-backed woodpecker	6/1 – 8/31	1 acre
Northern goshawk	4/15 – 8/15	40 acres
Great Gray Owl	3/15 – 7/15	30 acres

Active nests are those nests that are occupied during the year of implementation of activity at nest stand

Flammulated Owl

Wright et al. (Bitterroot) and numerous Linkhart papers (Colorado) were reviewed, but did not find information to help identify limited operating periods or nest buffers for this area. The following sources had some information.

McCallum (BNA 1994): early May for nesting from ne OR and BC; end of July for average fledging dates (5/1 – 7/30). Young stay within 100 m after fledging (328 ft) (area of 337,813 sq. ft. or 8 acres). Begin to attempt gleaning in 2nd week after fledging, independent after 30 days (end of August)

Hayward and Verner (1994): Appear to be tolerant to disturbance, maybe moderate tolerance to mechanical disturbance.

Reynolds and Linkhart (1987): CO, breeding adults located starting in early May, males arrive first, all territories occupied by 3rd week of May. Selected nest sites by late May. Male home ranges from 11-18 ha (27-44 acres). Young fledged in mid to late-July in CO. Owlets were independent by late August.

Linkhart 2001: flammulated owl fecundity is among the lowest and least variable of North American owls, few replacement clutches.

Goggans 1985: study in Oregon, Ponderosa pine, ponderosa pine/Douglas-fir, mixed conifer. Initial nest occupancy 12 June, mean fledging dates 26-28 July. Critical period is June 1 to July 31. 10 ha or 25-acre male home range.

Based on all of these sources, 35 acres was selected for the nest buffer as it includes the nesting home range and the area where fledglings are found immediately after fledging while they are flightless and vulnerable. There was no information found on a buffer for disturbance, these

owls appear to be fairly tolerant of disturbance. The limited operating period is based on Reynolds and Linkhart – territories occupied by 3rd week of May; and mid- August date accommodates the period post-fledging when owlets are still found in the vicinity of the nest (BNA). After that they can fly and forage and are more independent.

Bald Eagle

BEWG, 2010 – An addendum was prepared for the Montana Bald Eagle Management Guidelines (1994) to address recent changes in federal bald eagle regulations. This addendum includes recommended guidelines. The recommended primary seasonal restriction is from approximately February 1 through August 15th and applies to construction, maintenance and forest management activities. The visual buffer recommendation is to maintain existing visual buffers within ¼ mile of nest sites or ½ mile in the absence of a visual buffer.

Peregrine Falcon

Peregrine Fund, 1995. Occupancy in Montana begins April 1 and fledging ends by late July.

Peregrine Falcon Recovery Team, 1977 – Prohibit disturbance and human activity (above those that occurred historically) within a 0.50 mile of the nest between February 1 and August 1.

Based on the information found, April 1 to July 31 is the limited operating period, based on occupancy dates in Montana. The buffer of 0.50 mile is consistent with the 1977 Recovery Plan.

Black-backed woodpecker

Bonnot et al. 2006 – recommends no harvest June 1 to August 31 to prevent nests from being destroyed. Identify a “nest area” as 12.5 m radius around the nest; this comes out to less than 1 acre.

No further information on a nest buffer, so fall back to the 1 acre nest area. Frequency of use of previous year’s nests by black-backed woodpeckers was not found. This would likely apply if a nest happened to be found immediately prior to operations (most likely in a burned area).

Northern Goshawk

R1 Overview 2009 (USDA Forest Service 2009) – This document reviewed the most current literature and provides the best currently available information for determining limited operating periods and nest buffers. See that document for more on literature cited.

Pairs usually return by March or early April. Clough (west central Montana, Flint Creek Mountains, BDNF best available science for this area) noted beginning of incubation on May 5 and found fledged young capable of sustained flight by Aug 10. Kennedy et al found that during the fledgling dependency period, nearly 90% of the juveniles locations were within 656 ft. of the nest tree, the approximate radius of a 30-acre circular nest area. Fledgling movements outside of nest stand begin in mid-August. End of breeding season noted as August 15th.

Nest area – mature, closed canopies (50-90%) and open understories. Average size varies, Reynolds et al (1992) recommended 30 acres; Clough reported 40 acres in west central Montana.

In the Considerations for Project Analysis section they recommend a minimum 40-acre nest stand, but actual shape and size may vary based on the size of the stand, topography or other local conditions. They also recommended timing restrictions from April 15 through August 15 in the PFA.

Based on the above information, a 40-acre buffer was selected as it includes all of the nest area noted by Clough, and includes the area around the nest tree where juveniles would be found and agrees with the Considerations section of the Overview. April 15 was selected because that is close to when goshawks began incubation in the Flint Creek Mountains and agrees with the Considerations section of the Overview; and August 15 as young are capable of sustained flight and move out of nest stand by mid-August based on Clough (as noted in the Overview).

Great Gray Owl

Quintana-Coyer et al 2004 (Pacific Northwest) – begin incubation March 15, fledging July 15

MFWP Montana Field Guide – no information available from Montana, but information from other areas shows that they begin nesting in March or April

Bull and Duncan 1993 (BNA) – Egg laying in March in OR and Manitoba, late March in CA, early May in ID and WY. Late-March thru end July displayed on Breeding Cycle graphic.

Bull and Henjum -1990: Oregon egg-laying March 17 – April 17, young left nest by June 19. Males continued to feed for 3 months after leaving nest (mid-Sept). Defend only immediate nest site. First week after leaving the nest, the young stay within 200 m of nest (656 ft., area of 31 acres). Can fly within 2 weeks of leaving nest but use stands with high canopy cover.

Based on all of these sources, 30 acres was selected for the nest buffer as it includes the area where fledglings are found immediately after fledging while they are flightless and vulnerable (no information found on a buffer for disturbance). The limited operating period beginning in mid-March is consistent with the majority of these sources; and mid- July date accommodates the period post-fledging when owlets are still found in the vicinity of the nest. After that they can fly and forage and are more independent.

Monitoring – Wildlife Analysis on the Beaverhead-Deerlodge National Forest

Art Rohrbacher, August 2011

This report is a monitoring review of new information and recent public comment relating to the 2009 Forest Plan and Final Environmental Impact Statement wildlife analysis.

2009 Forest Plan and Final Environmental Impact Statement

The Final Environmental Impact Statement (FEIS) and the 2009 Forest Plan identify spatial and temporal scales to provide for wildlife security. Wildlife, in the context of security, includes elk. These spatial and temporal scales are: a) the BDNF ***landscape*** for roads that could be open anytime during the year and b) the 2006 Montana ***FWP hunting districts*** for roads that could be open during the fall general hunting season (10/15 through 12/1).

As described in table 14 of the 2009 Forest Plan, open motorized road and trail densities (OMRTD) during the fall general hunting season are notably lower than the desired OMRTD for the BDNF landscapes during the remainder of the year. This is to provide more security for wildlife during the fall general hunting season, recognizing the highest concentrated recreation use on the BDNF occurs during the fall general hunting season. Opportunities for fair chase hunting are still plentiful across the BDNF, as all areas are open for hunting on the BDNF with the exception of developed recreation and administrative sites.

Open motorized road and trail density metrics and geographic scales are identified in the 2009 Forest Plan and are appropriate for both Forest Plan NFMA and project-level analyses. Managing OMRTD is the most direct method of creating, maintaining and monitoring security for wildlife.

Consideration of New Information and Recent Public Comments

Recent public comments to BDNF project-level vegetation management proposals have requested project-level analyses for elk habitat based on metrics described in Hillis et al. 1991. Habitat management parameters suggested by Hillis et al. (1991) are:

- Forested cover blocks at least 250 acres in size,
- A distance of at least 0.5 miles from an open road
- A spatial allocation of 30 percent of the analysis area or more.

Hillis et al. (1991) recommend that vegetation density, topography, road access, hunter-use patterns and elk movements be considered. We note, however, that Hillis et al. (1991) do not define or recommend the size of the analysis area in which to analyze the 30 percent forest cover. Further, there is little or no information that the analysis parameters suggested by Hillis et al. (1991) are successful in moderating hunting season mortality rate. In effect, Hillis provides no insight on the statistical significance of various habitat factors for maintaining elk populations that are routinely hunted. Hayes et al. (2002) pointed out that while Hillis et al. (1991) reviewed the literature and formalized the conceptual model as a set of security habitat management factors, they did not directly or quantitatively link levels of these variables to a numerical hunting season mortality rate. Furthermore, Hillis's research was based west of the Continental Divide and the applicability to the eastside forests is uncertain.

Recent public comments have also requested analyses of hiding cover patches at least 600 feet wide for project-level vegetation management proposals. However, science shows, rather than

hiding cover, security based on OMRTD, particularly during hunting season, is key to elk population numbers.

Security is the protection inherent in any situation that allows elk to remain in a defined area despite an increase in stress or disturbance associated with the hunting season or other human activities. Security is a state of being, a condition or a functional concept most important when viewed in relation to the hunting season. Components of security may include vegetation, topography, aerial extent of habitat, road density, distance from roads, size of vegetation blocks, hunter density, season timing, and land ownership.

The BDNF uses OMRTD as the principle metric for analysis of potential effects of management activities to secure areas for wildlife at all spatial scales. This principle is well supported by the literature. The benefit of using OMRTD is that miles or road and trail are known and, for the most part, under the direct control of the Forest Service. Conversely, population numbers of elk are largely driven by harvest opportunity (upward of 90 percent of elk mortality stems from human hunting), and the management of harvest opportunity is the responsibility of Montana Fish, Wildlife and Parks. Likewise, vegetation- the key component of cover - is subject to impacts that are largely outside of the actual control of the Forest Service, such as insects, disease and wildfire.

There is substantial rationale for focusing on motorized access as the principle component of wildlife security. For example, numerous authors have described reductions in the effectiveness of elk habitat with increasing road and trail density. Lyon et al. (1985 p.6) summarized:

> *It has been repeatedly documented, in Montana and throughout North American elk range, that vehicle traffic on forest roads evokes an avoidance response by elk. Even though the habitat near forest roads is fully available to elk, it cannot be effectively utilized. Declines in elk use have been detected as far as 2 miles from open roads, but significant reductions in habitat effectiveness are usually confined to an area within a half mile. The loss of habitat effectiveness has been shown to be greatest near primary roads and least near primitive roads, greatest where cover is poor and least where cover is good, and greater during the hunting season than at any other time of the year. As a general average, habitat effectiveness can be expected to decline by one-fourth when road densities are 1 mile per section and by one-half when road densities are 2 miles per section.*

Several different data sets produced similar models to evaluate the impacts of route density on ungulates. Thomas et al. (1979 p.122) developed a habitat effectiveness/road density model that numerically corresponds to modeled habitat effectiveness described in the preceding paragraph. In essence, these models predict that the degree of selection of habitat by elk increases as the distance from open roads increases. This general premise is supported by later work by Rowland et al. (2000 p. 680).

Christensen et al. (1993) synthesized available habitat management concepts in Elk Management in the Northern Region: Considerations in Forest Plan Updates and Revisions. Christensen et al. (1993) stated “Roads are undoubtedly the most significant consideration on elk summer range” and reinforced that elk security is the primary concern in elk habitat management. Also, Christensen et al. (1993) directly equates habitat effectiveness to road density recommending “[f]or areas where elk are one of the primary resource considerations habitat effectiveness should be 50 percent or greater” equating to an open road density of no more than approximately 1.7 mi/sq.mi.

Wisdom et al. (2004) is one of the primary references used in the development of the 2009 Forest Plan. Wisdom et al. (2004) demonstrated a 43 percent probability (R=36% - 49%) that ATV use produces a threat response in elk at distances of 500 meters, and that the threat response declined notably when ATVs were 1000 meters distant.

There are a number of other authors who identify open motorized route density as the key consideration in elk security. Hayes et al. (2002) determined hiding cover and *interior hiding cover*[2] were not statistically significant variables influencing elk behavior in their northern Idaho elk study. In addition, Hayes et al. (2002) found that four of the 36 independent variables in their extensive elk study had significant univariate relationships with harvest mortality. These four significant independent variables were: total road density, hunting season structure, aspect, and percent moist shrubfield. Management of road density is the variable most readily changed by Forest Service management.

In South Dakota, Rumble and Gamo (2011) found that elk used ponderosa pine stands with lower stem density (and hence lower *standing visual obstruction*= hiding cover), than sites chosen at random:

> *"We were surprised that sites selected by elk had less hiding cover than random sites. Even though the Black Hills have extremely high road densities (~3.2km/km2 -5.1 mi/sq mi 1996 Land and Resource Management Plan, BHNF, Custer, SD), most observations of radio-collared elk in ponderosa pine occurred in sites that provided only 50–60% obstruction of a standing elk at 61 m, which was less cover than was available at random sites in ponderosa pine stands with =70% overstory cover.."*

This 50% obstruction is a marked contrast to the 90% obstruction used in the old Beaverhead (1986) and Deerlodge (1987) forest plans. This indicates that 90% hiding cover is not a determining factor for ascertaining elk security in the Black Hills.

Hayes et al. (2002) note:

> *"Unsworth et al. (1993) is the only study to establish a quantitative link between habitat characteristics and elk hunting season mortality rates in a multivariate context...Their model predicts increasing elk mortality with increases in open road and hunter density, and decreases in elk mortality as topography becomes more dissected. Vegetation variables such as hiding cover were not significant in the model developed by Unsworth et al. (1993).*
>
> *"The influence of habitat on elk hunting season mortality has been modeled conceptually for many years (Hieb 1976, Thomas 1991). Hillis et al. (1991) reviewed the literature and formalized the conceptual model as a set of security habitat management guidelines. They defined security areas as nonlinear blocks of hiding cover 101.2 ha and 0.8 km from any open road. However, they did not directly or quantitatively link levels of these variables to a numerical hunting season mortality rate."*

Unsworth et al. (1993) specifically note:

> *We are not aware of an elk population that is hunted (except those that are hunted under a very limited number of controlled permits) where it has been shown that environmental or*

[2] Hayes et al. (2002) developed *interior hiding cover* by constructing an interior polygon on an area mapped as "cover" and considered this inner polygon as potentially higher in habitat value that the area surrounding it.

habitat factors are limiting the male cohorts of the populations. Habitat is definitely important to the long term viability of elk populations, but we believe that elk populations are more likely to be controlled by harvest than by limits in cover or forage. In most years, hunters, their efficiency modified by road density and topography, control elk populations.

Conclusion:

The import of this discussion is that the 2009 Forest Plan emphasis on road density for secure areas for all wildlife is a valid metric for analyzing project level effects to elk with something that the Forest Service can manage – open motorized roads and trails. The authors quoted above directly link to Christensen et al. (1993), specifically the significance of roads in elk habitat management. Tables 13 and 14 of the 2009 Forest Plan reflect this consideration. Cover as noted in Hayes (2002), Unsworth (1993) is not a significant metric in elk analysis. The work of Ramo and Gumble (2011) showing elk selecting for more open habitats in the Black Hills with road densities at 5.1 miles /sq mile appear to support that hiding cover is not significant.

The overarching question regarding elk security is fundamentally tied to predation by man during the hunting season. Hayes et al. (2002) and Unsworth et al. (1993) both determined that vegetation is not a limiting factor for populations of hunted elk. Table 1 displays forested cover in large blocks for each hunting district based on a slightly modified Hillis buffer (1/3 mile versus 1/2 mile from open motorized routes). ***Particularly noteworthy is the wide variability of Forest Service ownership of large cover blocks.*** While elk do not reside exclusively on National Forest lands, they are widespread as shown in figures 1 and 2. The State Elk Plan (2004) routinely credits the importance of National Forest lands for maintaining elk. Populations for hunting districts that encompass portions of the BDNF are currently at State plan objectives (table 1). There is no information that the variability in forested cover on National Forest lands is a limiting factor on southwest Montana elk populations.

Table 1. BDNF Hunting District Ownership and Forested Cover Blocks

Hunting District Number	Total Acres	BDNF Acres	Percent of Hunting District in BDNF ownership	Forested Cover Acres in 250-acre or more blocks @ 0.33-mile buffer. No restriction on forest cover type	Forested cover Percent NF Acres in 250 ac or more blocks- No cover type restriction @ 0.33-mile buffer/	BDNF Cover blocks as Percent of Entire Hunting District
210	312773	88100	28%	24489 acres	28 %	7%
211	212424	194762	92%	95009	49	45
212	353307	176672	50%	47283	27	14
213	140784	70076	50%	13774	20	10
214	122547	69629	57%	15774	23	13
215	368284	80507	22%	11570	14	3
216	189730	70536	37%	25043	36	13
300	155930	76757	49%	10490	14	7
302	199862	71158	36%	6087	9	3
311	560789	2333	0%	1512	65	0
318	176143	143080	81%	26573	19	15

Hunting District Number	Total Acres	BDNF Acres	Percent of Hunting District in BDNF ownership	Forested Cover Acres in 250-acre or more blocks @ 0.33-mile buffer. No restriction on forest cover type	Forested cover Percent NF Acres in 250 ac or more blocks- No cover type restriction @ 0.33-mile buffer/	BDNF Cover blocks as Percent of Entire Hunting District
319	287187	182093	63%	67230	37	23
320	267907	85369	32%	22638	27	8
321	499708	310633	62%	112871	36	23
323	121403	99559	82%	43428	44	36
324	301004	175920	58%	61446	35	20
327	450669	128022	28%	36885	29	8
328	298943	124636	42%	34264	27	11
329	440851	140405	32%	51582	37	12
330	209103	70875	34%	23114	33	11
331	490828	296690	60%	87687	30	18
332	392625	287158	73%	140104	49	36
333	343158	102151	30%	27100	27	8
340	543562	108266	20%	30034	28	5
341	109927	37747	34%	8009	21	7
350	225069	168784	75%	70288	42	31
360	284617	70977	25%	50407	71	18
362	197754	53603	27%	29418	55	15
370	118282	42083	36%	16319	39	14
TOTAL	**8,375,170**	**3,528,581**	**42%**	**1,190,428**	**33.7%**	**14%**

We can discern no correlation to cover and hunter success (lack of security) when comparing table 1and table 2.

Table 2. Montana FWP elk harvest and hunter success on hunting units encompassing the BDNF

BDNF Hunting Unit	2004 Total Harvest/% Success	2005 Total Harvest/% Success	2006 Total Harvest/% Success	2007 Total Harvest/% Success	2008 Total Harvest/% Success	2009 Total Harvest/% Success	2010 Total Harvest/% Success
210	247/ 17	384/ 26.7	315/ 24.1	278/20.6	185/14.1	220/ 15.8	261/ 19.9
211	139/ 22.4	113/ 23.5	155/ 36.1	86/ 17.7	51/ 12.1	48/ 13.3	84/ 23.2
212	287/ 16.1	363/ 22.5	398/ 24.8	313/ 19.3	269/ 14.0	362/ 19.6	379/ 20.7
213	174/ 25.1	188/ 28.5	158/ 27.2	232/ 35.8	75/ 13.1	175/ 24.5	225/ 31.4
214	58/ 8.3	141/ 21.1	89/ 18.2	68/ 11.6	52/ 10.8	61/ 10.3	58/ 10.4
215	249/ 13.7	363/ 22.4	382/ 21.0	320/ 17.4	356/ 17.3	441/ 21.0	533/ 23.6
216	70/ 11.7	122/ 24.1	99/ 24.4	76/ 16.5	51/ 13.5	42/ 10.3	59/ 14.2
300	259/ 24.8	219/ 24.0	248/ 31.9	341/ 30.6	560/ 33.7	373/ 27.4	278/ 23.6
302	136/ 17.7	147/ 26.7	198/ 29.3	187/ 27.8	268/ 30.6	168/ 21.5	191/ 25.4
311	268/ 24.3	187/ 22.3	194/ 24.7	283/ 31.0	132/ 16.3	175/ 20.2	255/ 30.3

BDNF Hunting Unit	2004 Total Harvest/% Success	2005 Total Harvest/% Success	2006 Total Harvest/% Success	2007 Total Harvest/% Success	2008 Total Harvest/% Success	2009 Total Harvest/% Success	2010 Total Harvest/% Success
318	94/ 9.5	173/ 19.5	145/ 17.0	102/ 11.3	126/ 13.7	183/ 19.4	227/ 17.8
319	344/ 14.2	546/ 26.2	220/ 14.0	303/ 18.6	174/ 11.7	196/ 14.5	139/ 13.7
320	204/ 17.9	292/ 24.0	272/ 24.8	319/ 23.6	332/ 22.2	343/ 25.0	223/ 17.8
333	115/ 13.2	194/ 21.5	102/ 11.9	155/ 15.0	154/ 14.3	143/ 15.9	144/ 16.8
321	353/ 16.6	399/ 23.2	329/ 24.3	294/ 17.7	365/ 20.4	312/ 16.6	283/ 20.3
323	284/ 20.8	249/ 26.7	141/ 16.0	239/ 18.6	202/ 16.7	160/ 13.4	175/ 18.2
324	489/ 20.3	366/ 22.8	253/ 22.0	377/ 22.5	444/ 25.2	274/ 18.9	257/ 21.0
327	463/ 23.2	248/ 18.9	154/ 18.6	265/ 21.1	416/ 28.8	183/ 16.1	183/ 18.4
330	299/ 16.7	270/ 19.9	154/ 15.4	317/ 24.7	280/ 20.6	177/ 16.7	156/ 14.6
328	250/ 22.7	233/ 30.9	210/ 31.4	205/ 25.9	192/ 23.4	197/ 24.6	134/ 24.4
329	360/ 16.0	510/ 30.4	297/ 23.2	363/ 24.8	238/ 18.4	357/ 24.4	260/ 22.4
331	323/ 12.5	448/ 21.7	234/ 13.7	299/ 18.5	142/ 9.2	240/ 15.4	251/ 16.0
332	293/ 14.6	476/ 31.1	192/ 16.7	243/ 23.7	152/ 14.3	218/ 19.8	246/ 21.7
340	204/ 13.2	358/ 22.7	301/ 18.0	253/ 16.6	312/ 19.3	298/ 16.6	309/ 17.2
350	74/ 9.1	125/ 15.3	114/ 13.8	67/ 7.2	114/ 13.0	114/ 11.9	164/ 5.7
370	69/ 12.8	95/ 18.3	129/ 22.8	109/ 15.4	92/ 13.7	115/ 14.7	101/ 15.7
341	75/ 7.4	223/ 27.2	113/ 15.4	84/ 15.1	46/ 7.7	56/ 10.0	74/ 13.7
360	498/ 26.5	510/ 28.2	593/ 28.6	576/ 27.2	682/ 25.1	535/ 22.6	639/ 28.5
362	368/ 30.8	353/ 33.7	165/ 22.8	218/ 24.7	314/ 28.5	226/ 24.9	255/ 27.4
Total Harvest	**7046**	**7865**	**6354**	**6972**	**6276**	**6392**	**6543**

Review of distribution maps from Montana Fish, Wildlife, and Parks indicates elk are well distributed across the entire forest (Figures 1, 2, and 3).

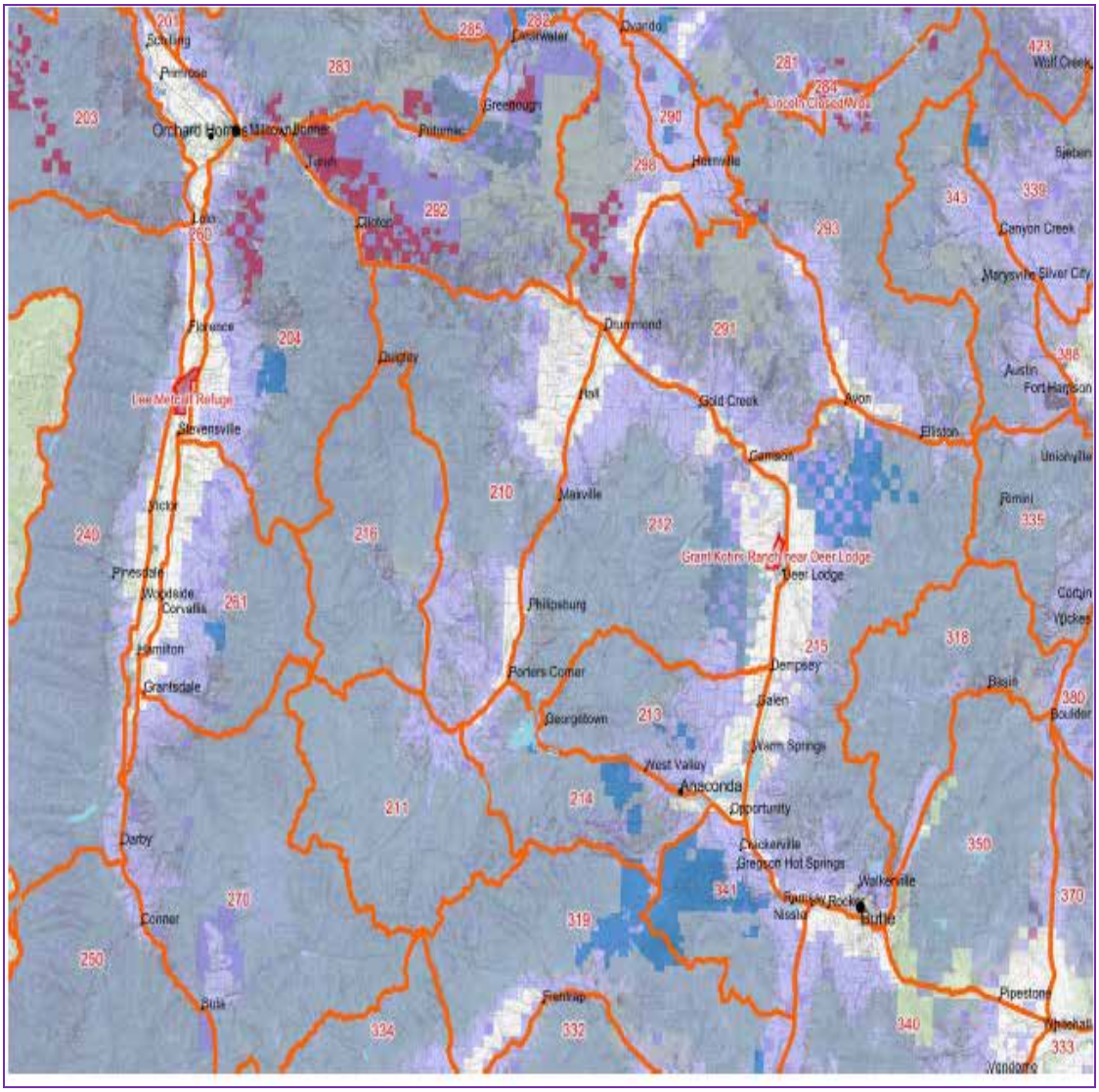

Figure F-2. Montana FWP Region 2 Elk Distribution

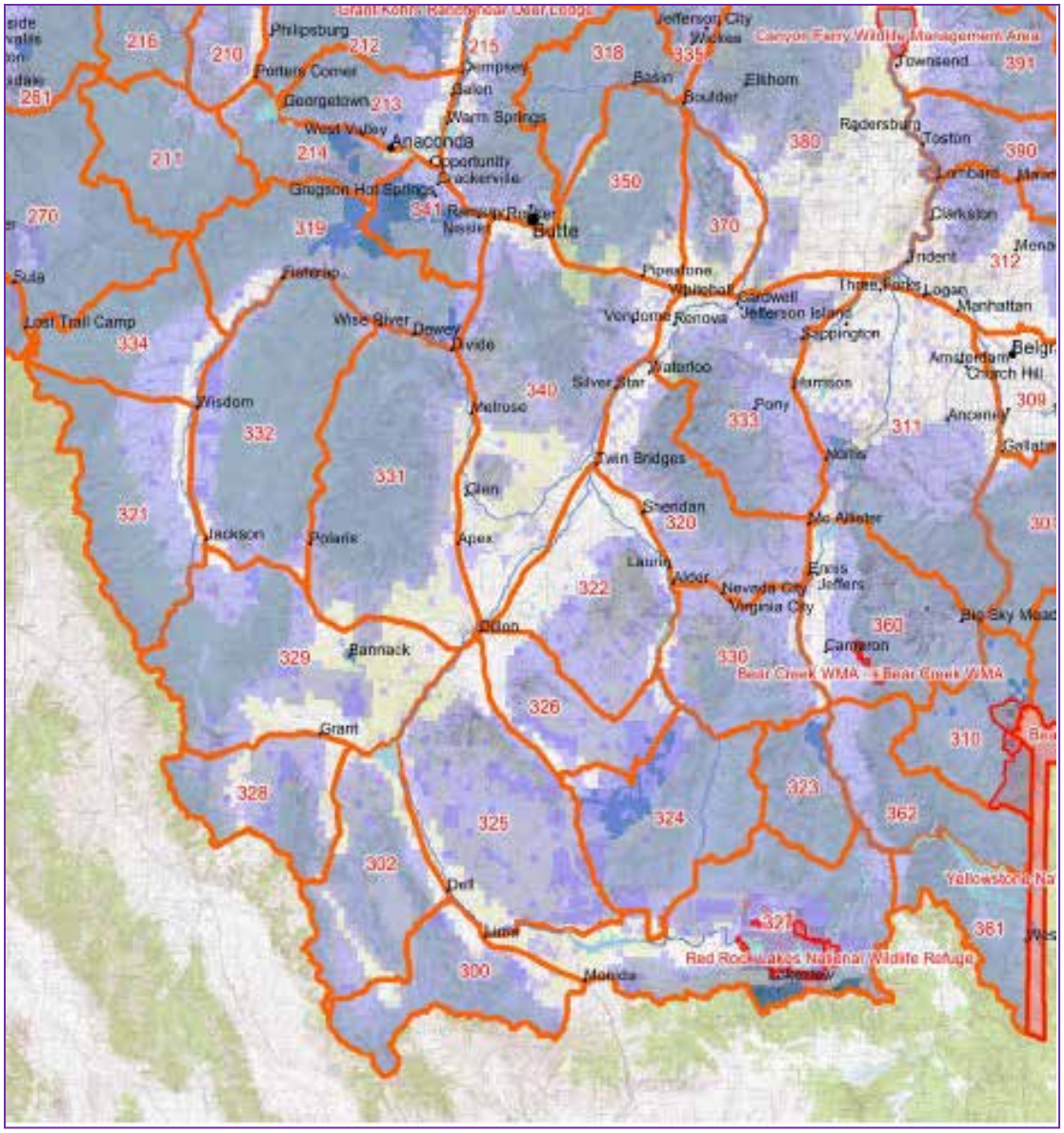

Figure F-3. Montana FWP Region 3 Elk Distribution

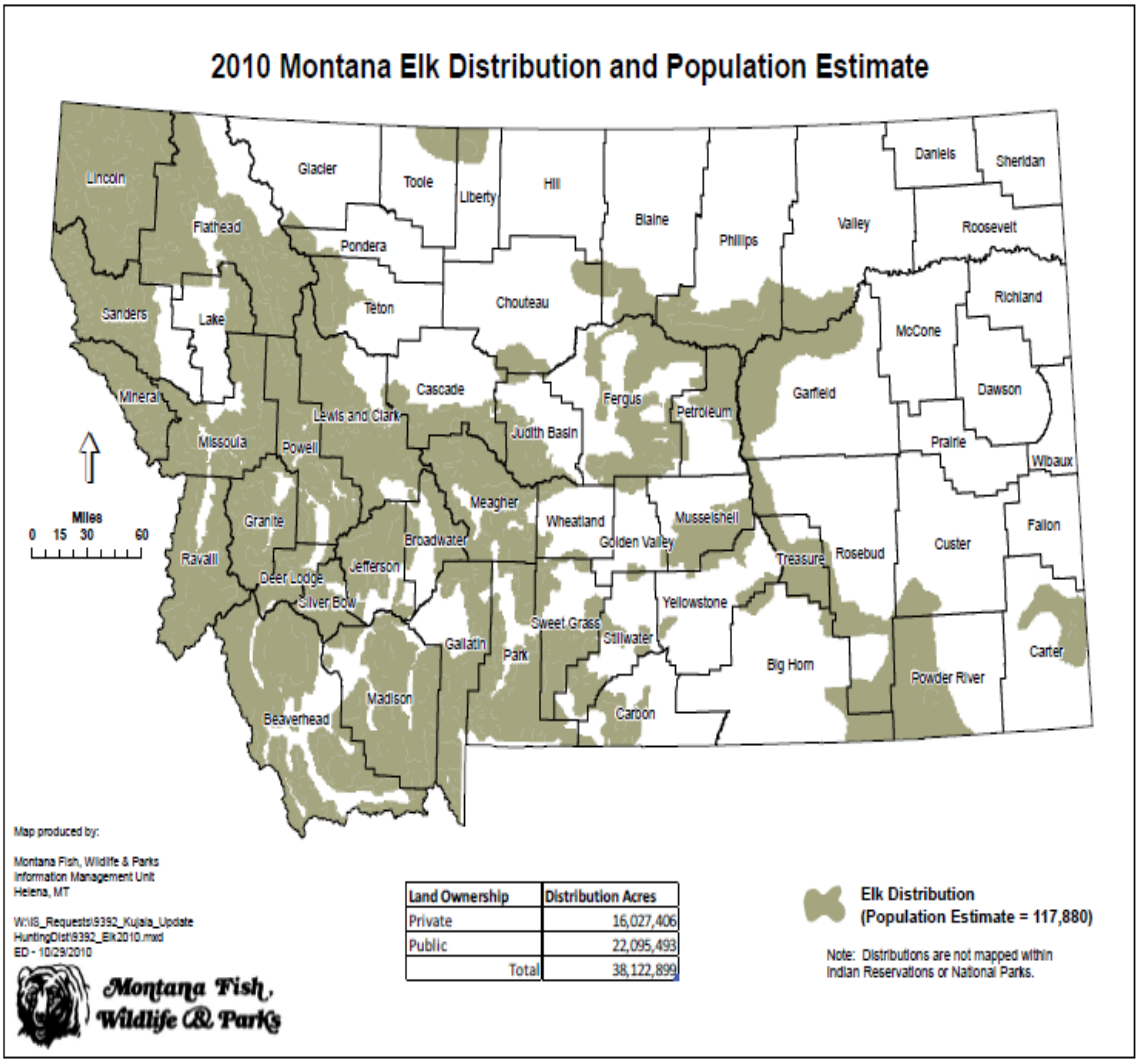

Figure 3. Montana elk distribution and population estimate

Public comments concerning thermal cover for elk have also been received for vegetation management proposals. Thomas et al. (2005) summarized recent work on thermal cover for elk:

> *The question of whether elk require or benefit from thermal cover was addressed in an experimental study at Kamela (Cook et al. 1998). Here, the nutritional condition of tractable elk maintained in pens was monitored in relation to varying amounts of thermal cover and no cover. Results, which detected no positive physiological benefits to elk from the presence of thermal cover, have changed managers' thinking about elk-cover relations (Cook et al. 2004a).*

Cook et al. 2005 note:

> *"Micro-weather characteristics measured during the study demonstrated that forest canopy reduced wind speed, reduced solar radiation flux during the day, and increased net radiation flux at night. They indicated little to no effect of forest canopy on ambient temperature or relative humidity.*

Evidence of support from habitat selection studies is only inferential (Riggs et al. 1993), and there is virtually no support for the thermal cover hypothesis from experimental research specifically designed to establish cause-and-effect relations.

No positive effects of thermal cover on elk were documented during any of the four winter experiments. But there were significant differences in body mass and body condition dynamics among cover treatments. Generally, elk in the dense forest stands lost the most mass and fat, elk in clearcuts lost least mass and fat, whereas mass and fat loss of elk in the moderate cover and combination cover units were intermediate.

During the two summer experiments, no significant differences were found in body mass, fat gain, or activity patterns among the four cover treatments. Elk in clearcuts and moderate cover treatment units consumed more water than did elk in dense cover units, however.

The BDNF recognizes habitat for elk in Oregon differs somewhat from that in southwest Montana. None the less, Cook et al. (2005) constitute experimental data from real elk that test the hypothesis of the value of thermal cover. Based on thorough review of Unsworth et al (1993), Hayes et al (2002) , Cook et al (2005), Rumble and Gamo (2011), which are the best available science postdating Hillis (1991) , forested cover for both hiding and thermal benefits are not significant metrics for elk analysis.

The use of road densities for elk analyses at all scales is appropriate. All elk on the BDNF are subject to hunting pressure which cannot be controlled by the Forest Service. As noted at Hayes et al (2002), open road density is the only significant variable that can be managed by the Forest Service for a hunted population. Road density management is being accomplished under the Forest Plan. Season of use and hunter densities (tag numbers) can be managed by Montana Fish, Wildlife, and Parks.

It should be noted that southwest Montana elk populations meet the State elk plan objectives at the forest scale and at virtually all of the hunting districts for project analysis (Table 3). With widespread distribution and no population deficiencies related to State objectives, elk constitute a robust presence on the BDNF.

Table 3. Montana Fish Wildlife and Parks Elk Objectives compared to Population Estimates

BDNF Hunting Districts	2005 FWP State Elk Plan Objective ± 20%	FWP 2003 Population Estimates ± 10%	FWP 2006 Population Estimates ± 10%	FWP 2007 Population Estimates ± 10%	FWP 2008 Population Estimates	FWP 2010 Population Estimates
210	2500	1043	952	1020	1391	1644
211	600	679	485	262	135	1125
212	850	1100	1074	1494	1825	2504
213	650	401	689	484	660	1325
214	200	309	270	284	331	400
215	1000	736	1144	1234	1502	2145
216	325	457	288	473	140	314
300	700-900	615	1137	1450	1883	806
302	550-700	399	736	956	1195	783
311	2700	2096	3100	3000	2620	2620
318	500	366	383	535	656	519

BDNF Hunting Districts	2005 FWP State Elk Plan Objective ± 20%	FWP 2003 Population Estimates ± 10%	FWP 2006 Population Estimates ± 10%	FWP 2007 Population Estimates ± 10%	FWP 2008 Population Estimates	FWP 2010 Population Estimates
319	1100 Max	1515	936	819	911	854
320 333	1000 for both	1130 549	942 470	745 477	954 859	1433 - at objective per FWP
321	None	No winter elk	No winter elk	No winter elk	No estimate	No estimate at objective
323 324 327 330 Total	Gravelly EMU Total = 7000	3119 3114 No winter elk 1830 (8063)	2682 2500 No winter elk 1132 (6314)	2265 1928 No winter elk 1116 (5309)	2268 2608 No estimate 1328 (6204)	No separate estimates – At objective per FWP
328	550-700	574	650	635	620	643
329	900 Max	582	683	727	766	(273 partial survey); at objective
331	1400 Max	1250	896	1085	773	869
332	900 Max	506	600	376	588	568
340 350 370	1600 combined for all	219 602 330 (1151)	557 268 192 (1017)	839 500 (1339)	423 529 529 (1481)	1915 for all; at objective
341	600 Max	669	494	272	166	416
360	2200	4555	1914	1661	2494	1090
362	2500	1159	3629	3845	3524	4203
TOTAL	**30,575**	**28,074**	**28,803 stable**	**28,482 stable**	**31,925 (increasing)**	**31,305 stable to increasing (above total objective)**

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Northern Rockies Lynx Management Direction - Standards & Guidelines Consistency Evaluation Table for Project Specific Activities

May 23, 2008

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Flint Foothills Project

Doug Middlebrook, 09/12/2012

Attachment A

Notes: (1) For those areas identified as occupied lynx habitat in the Occupied Mapped Lynx Habitat Amendment to the Canada Lynx Conservation Agreement (USDA Forest Service et al. 2006), management direction are the standards and guidelines displayed below. As stated in the ROD (p. 29) unoccupied forests should consider this management direction. (2) Where superscript numbers (43) appear, refer to the Glossary definitions on pages 11-15.

Table F- 2. Standards & guidelines for lynx management consistency evaluation table for project specific activities

Northern Rockies Lynx Management Direction	Is direction applicable to this project and has it been met (Yes or No and Met or Not Met)? Where direction is applicable but has not been met, explain the reason(s).
ALL MANAGEMENT PRACTICES AND ACTIVITIES (ALL) *The following objectives, standards and guidelines apply to management projects in lynx habitat in lynx analysis units (LAU) and in linkage areas, subject to valid existing rights. They do not apply to wildfire suppression, or to wildland fire use*	
Standard[43] ALL S1 New or expanded permanent developments[33] and vegetation management projects[48] must maintain[26] habitat connectivity[16] *in an LAU[21] and/or linkage area[22].*	Habitat connectivity will be maintained within the LAUs and across the analysis area. Units have forested cover around their perimeter; units will have snags and downed logs retained to meet Plan direction; and understory vegetation will increase with increased sunlight.
Guideline[15] ALL G1 Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways[18] or forest highways[12] across federal land. Methods could include fencing, underpasses or overpasses.	Not applicable
Standard LAU S1 *Changes in LAU[21] boundaries shall be based on site-specific habitat information and after review by the Forest Service Regional Office.*	Not applicable
VEGETATION MANAGEMENT PROJETS (VEG) *The following objectives, standards and guidelines apply to vegetation management projects in lynx habitat in lynx analysis units (LAU). With the exception of Objective VEG O3 that specifically concerns wildland fire use, the objectives, standards and guidelines do not apply to wildfire suppression, wildland fire use, or removal of vegetation for permanent developments like mineral operations, ski runs, roads and the like. None of the objectives, standards, or guidelines apply to linkage areas.*	

Northern Rockies Lynx Management Direction	Is direction applicable to this project and has it been met (Yes or No and Met or Not Met)? Where direction is applicable but has not been met, explain the reason(s).
Standard VEG S1 – Stand initiation structural stage limits Standard VEG S1 applies to all vegetation management[48] projects that regenerate[37] timber, except for fuel treatment[13] projects within the wildland urban interface (WUI) [49] as defined by HFRA, subject to the following limitation: Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects within the WUI see guideline VEG G10. The Standard: Unless a broad scale assessment has been completed that substantiates different historic levels of stand initiation structural stages[44] limit disturbance in each LAU as follows: If more than 30 percent of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects.	Applies and is met. None of the LAUs have had more than 14% regeneration harvest since the 1960s. Acres of past regeneration harvest by LAU range from 5-14%. See Table in Wildlife Specialist Report.
Standard VEG S2 – Limits on regeneration from timber mgmt. projects Standard VEG S2 applies to all vegetation management[48] projects that regenerate[37] timber, except for fuel treatment[13] projects within the wildland urban interface (WUI)[49] as defined by HFRA, subject to the following limitation: Fuel treatment projects within the WUI[49] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects within the WUI[49] see guideline VEG G10. The Standard: Timber management projects shall not regenerate[37] more than 15 percent of lynx habitat on NFS lands in an LAU in a ten-year period.	Applies and is met. The salvage units are considered clearcut regeneration harvests. Under Alternative 2, LAUs 28 would have 9% of lynx habitat affected, LAUs 18 and 30 would affect 8% of lynx habitat, and LAU 36 would affect 6% of lynx habitat. See Table 33 in the Wildlife Report. Past harvest includes completed and ongoing roadside salvage project. None of the LAUs would exceed 15% regeneration harvest of lynx habitat within 10 years.
Guideline VEG G11 – Denning habitat	Denning habitat includes mature to old growth forests with plenty of coarse

Northern Rockies Lynx Management Direction	Is direction applicable to this project and has it been met (Yes or No and Met or Not Met)? Where direction is applicable but has not been met, explain the reason(s).
Denning habitat[6] should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris[4], piles, or residual trees to provide denning habitat[6] in the future.	woody debris or younger stands with piles of coarse woody debris or areas where trees are jackstrawed. Units to be salvaged are dominated by dead and dying lodgepole pine and would lack the live canopy to moderate weather or intercept snow. Retained trees of other species (Douglas-fir, aspen, spruce and subalpine fir) as well as all trees (live or dead) >15" d.b.h. would still result in fairly open stands. Because no more than 9% of the mapped lynx habitat would be salvaged in any LAU, other mapped lynx habitat would continue to provide some level of denning habitat, especially in mixed stands where dead lodgepole will eventually fall and provide downed woody debris with an overstory canopy of other species.
Standard VEG S5 – Precommercial thinning limits Standard VEG S5 applies to all precommercial thinning[35] projects, except for fuel treatment[13] projects that use precommercial thinning as a tool within the wildland urban interface (WUI)[49] as defined by HFRA, subject to the following limitation: Fuel treatment projects within the WUI[49] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects within the WUI[49] see guideline VEG G10. The Standard: Precommercial thinning projects that reduce snowshoe hare habitat, may occur from the stand initiation structural stage[44] until the stands no longer provide winter snowshoe hare habitat only: 1. Within 200 feet of administrative sites, dwellings, or outbuildings; or 2. For research studies[38] or genetic tree tests evaluating genetically improved reforestation stock; or Based on new information that is peer reviewed and accepted by the regional	Applies. Both action alternatives have been modified to drop the more recent harvest areas and mitigation has been added to retain full-crowned trees with green branches within one foot of the ground. This would retain those trees that are providing cover or forage for snowshoe hares during the winter. However, field review conducted in 2012 shows that two units (36P and 39P) contain suitable snowshoe hare habitat. Precommercial thinning as proposed within these units would reduce suitable snowshoe hare habitat. Therefore, the action alternatives do not meet this standard.

Northern Rockies Lynx Management Direction	Is direction applicable to this project and has it been met (Yes or No and Met or Not Met)? Where direction is applicable but has not been met, explain the reason(s).
levels of the Forest Service and FWS, where a written determination states: that a project is not likely to adversely affect lynx; or that a project is likely to have short term adverse effects on lynx or its habitat, but would result in long-term benefits to lynx and its habitat; or 4. For conifer removal in aspen, or daylight thinning[5] around individual aspen trees, where aspen is in decline; or 5. For daylight thinning of planted rust-resistant white pine where 80 % of the winter snowshoe hare habitat[50] is retained; or 6. To restore whitebark pine.	
Standard VEG S6 – Multi-storied stands & snowshoe hare horizontal cover Standard VEG S6 applies to all vegetation management[48] projects that regenerate[37] timber, except for fuel treatment[13] projects within the wildland urban interface (WUI)[49] as defined by HFRA, subject to the following limitation: Fuel treatment projects within the WUI[49] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects within the WUI[49] see guideline VEG G10. The Standard: Vegetation management projects that reduce snowshoe hare habitat in multi-story mature or late successional forests[29] may occur only: Within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special use permit improvements, including infrastructure within permitted ski area boundaries; or 2. For research studies[38] or genetic tree tests evaluating genetically improved reforestation stock; or 3. For incidental removal during salvage harvest[41] (e.g. removal due to location of skid trails).	Stands to be salvaged are dominated by lodgepole pine and are not multi-storied stands. They are characterized by having very poorly developed understories and lack horizontal cover. Stands where commercial thinning and seed tree treatment is proposed are in dry Douglas-fir or ponderosa pine stands that generally lack multi-storied canopy and horizontal diversity. Therefore, commercial treatments meet this standard under both action alternatives. Preliminary review of prescribed burn units indicates that suitable snowshoe hare habitat may occur within Unit 5B. Additional field review is necessary to verify conditions for snowshoe hares within this unit. If suitable habitat is verified within Unit 5B, then proposed prescribed burn treatments may reduce snowshoe hare habitat.

Northern Rockies Lynx Management Direction	Is direction applicable to this project and has it been met (Yes or No and Met or Not Met)? Where direction is applicable but has not been met, explain the reason(s).
(NOTE: Timber harvest is allowed in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover [e.g. uneven age management systems could be used to create openings where there is little understory so that new forage can grow]).	
Guideline VEG G1 – Lynx habitat improvement Vegetation management[48] projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Priority should be given to stem-exclusion, closed-canopy structural stage[44] *stands for lynx or their prey (e.g. mesic, monotypic lodgepole stands).* Winter snowshoe hare habitat[50] should be near denning habitat[6].	Not applicable.
Guideline VEG G4 – Prescribed Fire Prescribed fire[34] activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.	Not applicable.
Guideline VEG G5 – Habitat for alternate prey species Habitat for alternate prey species, primarily red squirrel[36], should be provided in each LAU.	Habitat for red squirrels is being affected by mountain pine beetle mortality. Mixed conifer stands will be less affected and will continue to provide habitat.
Guideline VEG G10 – Fuel treatments in the WUI *Fuel treatment projects in the WUI [49] as defined by HFRA[17, 48] should be designed considering standards VEG S1, S2, S5, and S6 to promote lynx conservation.*	Not applicable.
LIVESTOCK MANAGEMENT (GRAZ) T*he following objectives and guidelines apply to grazing projects in lynx habitat in lynx analysis units (LAU). They do not apply to linkage areas.*	Not applicable, this is not a grazing project.
Guideline GRAZ G1 – Livestock grazing and openings In fire- and harvest-created openings, livestock grazing should be managed so impacts do not prevent shrubs and trees from regenerating.	
Guideline GRAZ G2 – Livestock grazing and aspen	

Northern Rockies Lynx Management Direction	Is direction applicable to this project and has it been met (Yes or No and Met or Not Met)? Where direction is applicable but has not been met, explain the reason(s).
In aspen stands, livestock grazing should be managed to contribute to the long-term health and sustainability of aspen.	
Guideline GRAZ G3 – Livestock grazing and riparian areas & willow carrs In riparian areas[40] and willow carrs[3], livestock grazing should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages[28] , similar to conditions that would have occurred under historic disturbance regimes.	
Guideline GRAZ G4 – Livestock grazing and shrub-steppe habitats In shrub-steppe habitats[42], livestock grazing should be managed in the elevation ranges of forested lynx habitat in LAUs[21], to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.	
HUMAN USE PROJETS (HU) The following objectives and guidelines apply to *human use projects, such as special uses (other than grazing), recreation management, roads, highways, mineral and energy development, in lynx habitat in lynx analysis units (LAU),* subject to valid existing rights. *They do not apply to vegetation management projects or grazing projects directly. They do not apply to linkage areas.*	
Guideline HU G1 – Ski area expansion & development, inter-trail islands When developing or expanding ski areas, provisions should be made for adequately sized inter-trail islands that include coarse woody debris[4], so winter snowshoe hare habitat[49] is maintained.	Not applicable.
Guideline HU G2 – Ski are expansion & development, foraging habitat When developing or expanding ski areas, foraging should be provided consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands of coniferous forest across mountain slopes.	Not applicable.
Guideline HU G3 – Recreation developments Recreation developments and operations should be planned in ways that both provide for lynx movement and maintain the effectiveness of lynx habitat[23].	Not applicable.

Northern Rockies Lynx Management Direction	Is direction applicable to this project and has it been met (Yes or No and Met or Not Met)? Where direction is applicable but has not been met, explain the reason(s).
Guideline HU G4 – Mineral & energy development For mineral and energy development sites and facilities, remote monitoring should be encouraged to reduce snow compaction.	Not applicable.
Guideline HU G5 – Mineral & energy development, habitat restoration For mineral and energy development sites and facilities that are closed, a reclamation plan that restores[39] lynx habitat should be developed.	Not applicable.
Guideline HU G6 – Roads, upgrading Methods to avoid or reduce effects to lynx should be used in lynx habitat when upgrading unpaved roads to maintenance levels 4 or 5, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development.	No road maintenance levels would increase to level 4 or 5.
Guideline HU G7 – Roads, locations New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity[16]. New permanent roads and trails should be situated away from forested stringers.	Not applicable.
Guideline HU G8 – Roads, brushing Cutting brush along low-speed[25], low-traffic-volume roads should be done to the minimum level necessary to provide for public safety.	Not applicable.
Guideline HU G9 – Roads, new On new roads built for projects, public motorized use should be restricted. Effective closures should be provided in road designs. When the project is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives.	Applicable. New temporary roads will be closed to public use during project activities and subsequently decommissioned. New FS system road totaling 1.26 mi. will be closed to public use.
Guideline HU G10 – Roads, ski area access *When developing or expanding ski areas and trails, access roads and lift termini to maintain and provide lynx security[10] habitat.*	Not applicable.
Guideline HU G11 – Snow compaction Designated over-the-snow routes, or designated play areas, should not expand outside baseline areas of consistent snow compaction[1], unless designation serves	Not applicable.

Northern Rockies Lynx Management Direction	Is direction applicable to this project and has it been met (Yes or No and Met or Not Met)? Where direction is applicable but has not been met, explain the reason(s).
to consolidate use and improve lynx habitat. This is calculated on an LAU basis, or on a combination of immediately adjacent LAUs. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by Guideline HU G12. Use the same analysis boundaries for all actions subject to this guideline.	
Guideline HU G12 – Winter access for non-recreation SUP & mineral & energy development Winter access for non-recreation special uses, and mineral and energy exploration and development, should be limited to designated routes[8] or designated over-the-snow routes[7].	Not applicable.
LINKAGE AREAS (LINK) The following objective, standard and guidelines apply to *all projects within linkage areas,* subject to valid existing rights.	
Standard LINK S1 – Highway or forest highway construction in linkage areas When highway[18] or forest highway[12] construction or reconstruction is proposed in linkage areas[22], identify potential highway crossings.	Not applicable
Guideline LINK G1 – Land exchanges NFS lands should be retained in public ownership.	Not applicable
Guideline LINK G2 – Livestock grazing in shrub-steppe habitats *Livestock grazing in shrub-steppe habitats[42] should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages[28], similar to conditions that would have occurred under historic disturbance regimes.*	Not applicable

Glossary

[1] *Areas of consistent snow compaction* – An area of consistent snow compaction is an area of land or water that during winter is generally covered with snow and gets enough human use that individual tracks are indistinguishable. In such places, compacted snow is evident most of the time, except immediately after (within 48 hours) snowfall. These can be areas or linear routes, and are generally found in near snowmobile or cross-country ski routes, in adjacent openings, parks and meadows, near ski huts or plowed roads, or in winter parking areas. Areas of consistent snow compaction will be determined based on the area or miles used in 1998 to 2000.

[2] *Broad scale assessment* – A broad scale assessment is a synthesis of current scientific knowledge, including a description of uncertainties and assumptions, to provide an understanding of past and present conditions and future trends, and a characterization of the ecological, social and economic components of an area. (LCAS)

[3] *Carr* – Deciduous woodland or shrub land occurring on permanently wet, organic soil. (LCAS)

[4] *Course woody debris* – Any piece(s) of dead woody material, e.g., dead boles, limbs, and large root masses on the ground or in streams. (LCAS)

[5] *Daylight thinning* – Daylight thinning is a form of precommercial thinning that removes the trees and brush inside a given radius around a tree.

[6] *Denning habitat (lynx)* – Denning habitat is the environment lynx use when giving birth and rearing kittens until they are mobile. The most common component is large amounts of coarse woody debris to provide escape and thermal cover for kittens. Denning habitat must be within daily travel distance of winter snowshoe hare habitat – the typical maximum daily distance for females is about three to six miles. Denning habitat includes mature and old growth[24] forests with plenty of coarse woody debris. It can also include young regenerating forests with piles of coarse woody debris, or areas where down trees are jack-strawed.

[7] *Designated over-the-snow routes* – Designated over-the-snow routes are routes managed under permit or agreement or by the agency, where use is encouraged, either by on-the-ground marking or by publication in brochures, recreation opportunity guides or maps (other than travel maps) or in electronic media produced or approved by the agency. The routes identified in outfitter and guide permits are designated by definition; groomed routes also are designated by definition. The determination of baseline snow compaction will be based on the miles of designated over-the-snow routes authorized, promoted or encouraged in 1998 to 2000.

[8] *Designated route* – A designated route is a road or trail that has been identified as open for specified travel use.

[9] *Developed recreation* – Developed recreation requires facilities that result in concentrated use. For example, skiing requires lifts, parking lots, buildings and roads; campgrounds require roads, picnic tables and toilet facilities.

[10] *Security habitat (lynx)* – Security habitat amounts to places in lynx habitat that provide secure winter bedding sites for lynx in highly disturbed landscapes like ski areas. Security habitat gives lynx the ability to retreat from human disturbance. Forest structures that make human access difficult generally discourage human activity in security habitats. Security habitats are most effective if big enough to provide visual and acoustic insulation and to let lynx easily move away from any intrusion. They must be close to winter snowshoe hare habitat. (LCAS)

[11] *Fire use* – Fire use is the combination of wildland fire use and using prescribed fire to meet resource objectives. (NIFC) Wildland fire use is the management of naturally ignited wildland fires to accomplish resource management objectives in areas that have a fire management plan. The use of the term wildland fire use replaces the term prescribed natural fire. (Wildland and Prescribed Fire Management Policy, August 1998)

[12] *Forest highway* – A forest highway is a forest road under the jurisdiction of, and maintained by, a public authority and open to public travel (USC: Title 23, Section 101(a)), designated by an agreement with the FS, state transportation agency and Federal Highway Administration.

[13] *Fuel treatment* – A fuel treatment is a management action that reduces the threat of ignition and fire intensity or rate of spread, or is used to restore fire-adapted ecosystems.

[14] *Goal* – A goal is a broad description of what an agency is trying to achieve, found in a land management plan. (LCAS)

[15] *Guideline* – A guideline is a particular management action that should be used to meet an objective found in a land management plan. The rationale for deviations may be documented, but amending the plan is not required. (LCAS modified)

[16] *Habitat connectivity (lynx)* – Habitat connectivity consists of an adequate amount of vegetation cover arranged in a way that allows lynx to move around. Narrow forested mountain ridges or shrub-steppe plateaus may serve as a link between more extensive areas of lynx habitat; wooded riparian areas may provide travel cover across open valley floors. (LCAS)

[17] *HFRA (Healthy Forests Restoration Act)* - Public Law 108-148, passed in December 2003. The HFRA provides statutory processes for hazardous fuel reduction projects on certain types of at-risk National Forest System and Bureau of Land Management lands. It also provides other authorities and direction to help reduce hazardous fuel and restore healthy forest and rangeland conditions on lands of all ownerships. (Modified from Forest Service HFRA web site.)

[18] *Highway* – The word highway includes all roads that are part of the National Highway System. (23 CFR 470.107(b))

[19] *Horizontal cover* – Horizontal cover is the visual obscurity or cover provided by habitat structures that extend to the ground or snow surface primarily provided by tree stems and tree boughs, but also includes herbaceous vegetation, snow, and landscape topography. Horizontal cover was measured by John Squires et al. (pers. com.) in Northwestern Montana according to the following methodology:

"A canvas cover-board (2 m x 0.5 m) was erected 10 m from plot center in 4 directions (forward track, back track, and at 2, 90° angles) was read to directly measure horizontal cover. The cover board was divided into 4, 0.5 meter blocks and each block was further dividend into quarters. At each reading, technicians estimated horizontal cover by 10% class at each of the 4 heights; these 4 estimates were then averaged for an overall estimate of that reading." (According to Squires via pers. com., cover measured during the summer period averaged approximately 65% while at den sites it was measured at roughly 85%. During the winter period cover was measured at 45% while at winter kill sites it was slightly greater than 50%.)

[20] *Isolated mountain range* – Isolated mountain ranges are small mountains cut off from other mountains and surrounded by flatlands. On the east side of the Rockies, they are used for analysis instead of sub-basins. Examples are the Little Belts in Montana and the Bighorns in Wyoming.

[21] *LAU (Lynx Analysis Unit)* – An LAU is an area of at least the size used by an individual lynx, from about 25 to 50 square miles (LCAS). An LAU is a unit for which the effects of a project would be analyzed; its boundaries should remain constant.

[22] *Linkage area* – A linkage area provides connectivity between blocks of lynx habitat. Linkage areas occur both within and between geographic areas, where basins, valleys or agricultural lands separate blocks of lynx habitat, or where lynx habitat naturally narrows between blocks. (LCAS updated definition approved by the Steering Committee 10/23/01)

[23] *Lynx habitat* – Lynx habitat occurs in mesic coniferous forest that experience cold, snowy winters and provide a prey base of snowshoe hare. In the northern Rockies, lynx habitat is generally occurs between 3,500 and 8,000 feet of elevation, and primarily consists of lodgepole pine, subalpine fir and Engelmann spruce. It may consist of cedar-hemlock in extreme northern Idaho, northeastern Washington and northwestern Montana, or of Douglas fir on moist sites at higher elevations in central Idaho. It may also consist of cool, moist Douglas fir, grand fir, western larch and aspen when interspersed in subalpine forests. Dry forests do not provide lynx habitat. (LCAS)

[24] *Lynx habitat in an unsuitable condition* –Lynx habitat in an unsuitable condition consists of lynx habitat in the stand initiation structural stage where the trees are generally less than ten to 30 years old and have not grown tall enough to protrude above the snow during winter. Stand replacing fire or certain vegetation management projects can create unsuitable conditions. Vegetation management projects that can result in unsuitable habitat include clearcuts and seed tree harvest, and sometimes shelterwood cuts and commercial thinning depending on the resulting stand composition and structure. (LCAS)

[25] *Low-speed, low-traffic-volume road* – Low speed is less than 20 miles per hour; low volume is a seasonal average daily traffic load of less than 100 vehicles per day.

[26] *Maintain* – In the context of this amendment, maintain means to provide enough lynx habitat to conserve lynx. It does not mean to keep the status quo.

[27] *Maintenance level* – Maintenance levels define the level of service provided by and maintenance required for a road. (FSH 7709.58, Sec 12.3) Maintenance level 4 is assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most level 4 roads have double lanes and aggregate surfaced. Some may be single lane; some may be paved or have dust abated. Maintenance level 5 is assigned to roads that provide a high degree of user comfort and convenience. Normally, roads are double-lane and paved, but some may be aggregate surfaced with the dust abated.

[28] *Mid-seral or later* – Mid-seral is the successional stage in a plant community that's the midpoint as it moves from bare ground to climax. For riparian areas, it means willows or other shrubs have become established. For shrub-steppe areas, it means shrubs associated with climax are present and increasing in density.

[29] *Multi-story mature or late successional forest* – This stage is similar to the *old multistory structural stage (see below)*. However, trees are generally not as old and decaying trees may be somewhat less abundant.

[30] *Objective* – An objective is a statement in a land management plan describing desired resource conditions and intended to promote achieving programmatic goals. (LCAS)

[31] *Old multistory structural stage* – Many age classes and vegetation layers mark the old forest, multistoried stage. It usually contains large old trees. Decaying fallen trees may be present that leave a discontinuous overstory canopy. On cold or moist sites without frequent fires or other disturbance, multi-layer stands with large trees in the uppermost layer develop. (Oliver and Larson, 1996)

[32] *Old growth* – Old growth forests generally contain trees that are large for their species and site, and are sometimes decadent with broken tops. Old growth often contains a variety of tree sizes, large snags and logs, and a developed and often patchy understory.

[33] *Permanent development* – A permanent development is any development that results in a loss of lynx habitat for at least 15 years. Ski trails, parking lots, new permanent roads, structures, campgrounds and many special use developments would be considered permanent developments.

[34] *Prescribed fire* – A prescribed fire is any fire ignited as a management action to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements met, before ignition. The term replaces management ignited prescribed fire. (NWCG)

[35] *Precommercial thinning* – Precommercial thinning is mechanically removing trees to reduce stocking and concentrate growth on the remaining trees, and not resulting in immediate financial return. (Dictionary of Forestry)

[36] *Red squirrel habitat* – Red squirrel habitat consists of coniferous forests of seed and cone-producing age that usually contain snags and downed woody debris, generally associated with mature or older forests.

[37]*Regeneration harvest* – The cutting of trees and creating an entire new age class; an even-age harvest. The major methods are clearcutting, seed tree, shelterwood, and group selective cuts (Helms 1998).

[38] *Research* – Research consists of studies conducted to increase scientific knowledge or technology. For the purposes of Standards VEG S5 and VEG S6, research applies to studies financed from the forest research budget (FSM 4040) and administrative studies financed from the NF budget.

[39] *Restore, restoration* – To restore is to return or re-establish ecosystems or habitats to their original structure and species composition. (Dictionary of Forestry)

[40] *Riparian area* – An area with distinctive soil and vegetation between a stream or other body of water and the adjacent upland; includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation. (LCAS)

[41] *Salvage harvest* – Salvage harvest is a commercial timber sale of dead, damaged or dying trees. It recovers economic value that would otherwise be lost. Collecting firewood for personal use is not considered salvage harvest.

[42] *Shrub steppe habitat* – Shrub steppe habitat consists of dry sites with shrubs and grasslands intermingled.

[43] *Standard* – A standard is a required action in a land management plan specifying how to achieve an objective or under what circumstances to refrain from taking action. A plan must be amended to deviate from a standard.

[44] *Stand initiation structural stage* – The stand initiation stage generally develops after a stand-replacing disturbance by fire or regeneration timber harvest. A new single-story layer of shrubs, tree seedlings and saplings establish and develop, reoccupying the site. Trees that need full sun are likely to dominate these even-aged stands. (Oliver and Larson, 1996)

[45] *Stem exclusion structural stage* – In the stem exclusion stage, trees initially grow fast and quickly occupy all of the growing space, creating a closed canopy. Because the trees are tall, little light reaches the forest floor so understory plants (including smaller trees) are shaded and grow more slowly. Species that need full sunlight usually die; shrubs and herbs may become dormant. New trees are precluded by a lack of sunlight or moisture. (Oliver and Larson, 1996)

[46] *Timber management* – Timber management consists of growing, tending, commercially harvesting and regenerating crops of trees.

[47] *Understory re-initiation structural stage* – In the understory re-initiation stage, a new age class of trees gets established after overstory trees begin to die, are removed or no longer fully occupy their growing space after tall trees abrade each other in the wind. Understory seedlings then re-grow and the trees begin to stratify into vertical layers. A low to moderately dense uneven-aged overstory develops, with some small shade-tolerant trees in the understory. (Oliver and Larson, 1996)

[48] *Vegetation management projects* – Vegetation management projects change the composition and structure of vegetation to meet specific objectives, using such means as prescribed fire and timber harvest. For the purposes of this amendment, the term does not include removing vegetation for permanent developments like mineral operations, ski runs, roads and the like, and does not apply to fire suppression or to wildland fire use.

[49] *Wildland urban interface (WUI)* - The area adjacent to an at-risk community that is identified in the community wildfire protection plan. If there is no community wildfire protection plan in place, the WUI is the area 0.5 mile from the boundary of an at-risk community or within 1.5 miles of the boundary of an at-risk community. The WUI could also include areas if the terrain is steep, or there is a nearby road or ridge top that could be incorporated into a fuel break, or the land is in condition class 3, or the area contains an emergency exit route needed for safe evacuations. (Condensed from HFRA. For full text see HFRA § 101.)

[50] *Winter snowshoe hare habitat* – Winter snowshoe hare habitat consists of places where young trees or shrubs grow dense – thousands of woody stems per acre – and tall enough to protrude above the snow during winter, so hares can browse on the bark and small twigs (Ruediger et al. 2000). Winter snowshoe hare habitat develops primarily in the stand initiation, understory reinitiation and old forest multistoried structural stage.