United States
Department of
Agriculture

Forest
Service

January 2013

Draft Environmental Impact Statement

Ochoco Summit Trail System

Ochoco National Forest
Crook and Wheeler Counties, Oregon

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Ochoco Summit Trail System Project
Draft
Environmental Impact Statement
Crook County, Oregon

Lead Agency: **USDA Forest Service**

Responsible Official: **Kate Klein**
3160 NE 3rd Street
Prineville, OR 97754

For Information Contact: **Dede Steele, Project Leader**
3160 NE 3rd Street
Prineville, OR 97754
541-416-6500

Abstract: This Draft Environmental Impact Statement analyzes four alternatives related to the development of a trail for motorized off-highway vehicles (OHVs) on the Ochoco National Forest. Alternative 1 is the no action alternative, which would not develop or designate trail for OHVs. Alternative 2 is the proposed action; it would create a 170-mile trail network, providing areas intended for use by motorcycles, ATVs, and Jeeps and 4 x 4 trucks. Alternative 3 would create a 101-mile trail network, providing areas intended for use by motorcycles and ATVS, and would not designate a trail system intended for jeeps and 4 x 4s. Alternative 4 would create a 212-mile trail network, providing areas for all three classes of off-highway vehicles. The Responsible Official has identified Alternative 3 as the preferred alternative.

Reviewers should provide the Forest Service with their comments during the review period of the draft environmental impact statement. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the final environmental impact statement, thus avoiding undue delay in the decision-making process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewers' position and contentions. Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553 (1978). Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the final environmental impact statement. City of Angoon v. Hodel (9th Circuit, l986) and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Comments on the draft environmental impact statement should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

Date Comments Must Be Received: **45 days following publication of the Notice of Availability in the *Federal Register***

Mail or Hand-deliver Comments to: **Ochoco Summit Planning Team**
c/o Ranger Slater Turner
Ochoco National Forest
3160 NE 3rd Street
Prineville, OR 97754

Email Comments to: ***comments-pacificnorthwest-ochoco@fs.fed.us***

FAX Comments to: **Ochoco Summit Planning Team**
c/o Ranger Slater Turner
(541) 416-6695

SUMMARY

The Forest Service has prepared this Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act and other relevant Federal and State laws and regulations. This EIS analyzes a proposal to create a designated system of trails for motorized off-highway vehicles (OHV) on the Ochoco National Forest. Map 1 shows Ochoco Summit Trail System project area; Map 2 shows the Ochoco National Forest Management Areas within the project area.

Why is the action being proposed?

The 2011 Final Environmental Impact Statement and Record of Decision for the Deschutes and Ochoco National Forests Travel Management Plan implemented the 2005 Travel Management Rule by designating routes on which motorized travel is allowed and eliminating the opportunity for cross-country motorized travel. The purpose and need for this proposal was derived from evaluating the Ochoco National Forest Land and Resource Management Plan (Forest Plan) (USDA Forest Service, 1989), identifying desired future conditions for motorized recreation, and comparing them to the existing conditions in the project area. The purposes of this proposal are to:

1. Designate a sustainable system of roads, trails and areas open to motor vehicles that will provide legal public access, enhance regulation of unmanaged wheeled motor vehicle travel, protect resources, and decrease conflicts between motorized and non-motorized use on the Ochoco National Forest.
2. Change the existing system of NFS motorized-use trails to provide a sufficient number and length of trail in a forested setting to disperse recreational users and make a sustainable network of trails.
3. Provide a diversity of off-highway motorized recreation opportunities including 4x4 vehicles, ATVs and motorcycles, consistent with Forest Service policy to provide a diversity of road and trail opportunities for experiencing a variety of environments and modes of travel.

What action is proposed?

Alternative 2 focuses on designating motorized trails and supporting areas, in conjunction with opportunities that would remain on mixed use roads identified in the forest-level Travel Management EIS (see Maps 3 and 4).

The Proposed Action would:

- Designate a system of trails and areas (including staging areas, play areas, riding areas where young riders may be supervised by adults, learner/warm-up loops, picnic and camping areas) by class of vehicle and season of use.
- Utilize designated open motorized mixed use roads as connecters between trail segments.
- Designate areas for developed and dispersed camping activities with legal trail access.
- Implement rehabilitation or restoration activities in previously damaged areas and interconnecting unauthorized or user-created routes to promote recovery, and to prevent confusion about which routes are open and which are not.

- Establish directional, informational and interpretive signing to: facilitate proper trail use, safety and enforcement; to provide public information and education; to define trail, riding area, staging area and camp sites locations; to promote recovery of rehabilitation and restoration sites; and to encourage reporting of violations, restoration or maintenance needs.
- Motorized trails would be open for use by specified vehicle type, seasonally between May 1 and November 1 of each year, except on Paulina Ranger District, where trails would close at the beginning of the restriction period specified for the Rager Cooperative Travel Management Area, and would remain closed until May 1 of each year.
- Non-motorized use would not be prohibited on proposed motorized trails.
- Camping would be allowed at staging areas within designated camp sites, as well as in dispersed camp sites at trailheads or as allowed in the current Travel Management Plan.

The Proposed Action maps show where the proposed routes and supporting areas are located and how the routes overlay existing soil disturbance as identified by the presence of existing NFS roads. Refer to the legend for route color codes: existing disturbance is shown by the two colors used to display roads (orange, green). The Proposed Action maps also display quality of user experience as determined by whether the proposed route provides potential for trail features (narrow, winding, challenging) or whether it falls on an open road (easy travel, easy access, mixed traffic). Refer to the legend for route color codes: road-to-trail conversions are proposed on closed/decommissioned roads (green), while new trail construction is proposed on route segments that are not on NFS roads (blue). Routes on open mixed use roads are shown in orange.

Trails would be designed with width and difficulty appropriate for each intended vehicle type, while roads designated as open in the forest-level Travel Management EIS would not be narrowed to trail standards (ie. designated open roads would remain designated open roads). Trail widths would be based on intended vehicle types, which are also displayed on Maps 3 and 4. Refer to the legend for vehicle types I, II and III. Motorcycle-only trails (single track) would be designed for 24” wide clearance and are displayed on the maps as a dashed line. Only single track vehicles would be allowed on single track trails (ie. no ATVs or 4x4s). All-terrain vehicle (ATV) trails would be designed for 50” wide clearance and are displayed as a dotted line on the maps. ATV trails would be available for use by ATVs and motorcycles but not 4x4s or side-by-side buggies. Class II trails would be designed for 80” wide clearance and are displayed on the maps as a line with cross bars. Class II trails would be available for use by any vehicle with an outside maximum width of less than 80” (jeeps, ¼ ton trucks and SUVs, side-by-side buggies, rock crawlers, etc.)

This project does not propose to change roads that would be open or closed to motorized access under the forest-level Travel Management EIS. The routes shown on these maps include proposed trails as well as about 45 miles of interconnected roads that are designated for mixed use by highway legal and non-highway legal vehicles (OHVs and passenger cars/trucks). The open roads are not changed from the forest-level EIS, but are shown on the Proposed Action map as they serve as connectors between trail segments, or they enhance loop opportunities/options for trail users.

***The Proposed Action trail network includes*:**

Overall, the OHV network displayed on the Proposed Action maps includes approximately 124 miles of proposed OHV trail and 45 miles of open National Forest System (NFS) roads that connect trail segments or contribute to the network by providing alternate “get-back” routes or other recreational experiences.

Of the total 69 miles in the Class I vehicle (ATV) network, 14 miles are on open roads, 25 miles are on closed or decommissioned road beds and 30 miles are not on NFS roads. This would allow for up to 55 miles of 50" wide trail through conversion of old road beds and new trail construction combined. In addition all Class II trails would be available for use by ATVs. Mixed use roads identified under the forest-wide Travel Management EIS would also remain available for use by ATVs.

Of the total 48 miles in the Class II vehicle (jeep, small truck and buggy) network, 28 miles are on open roads, 8 miles are on closed or decommissioned road beds and 12 miles are not on NFS roads. This would allow for up to 20 miles of 80" wide trail through conversion of old road beds and new trail construction combined. Mixed use roads identified under the forest-wide Travel Management EIS would remain available for use by non-highway-legal jeeps and buggies and highway-legal vehicles would have access to all roads identified as open in the forest-wide EIS.

Of the total 52 miles of Class III vehicle (motorcycle) network, 4 miles are on open roads, 23 miles are on closed or decommissioned road beds and 26 miles are not on NFS roads. This would allow for up to 49 miles of 24" wide trail through conversion of old road beds and new trail construction combined. In addition all Class I and II trails would be available for use by motorcycles. Mixed use roads identified under the forest-wide Travel Management EIS would remain available for use by non-highway-legal motorcycles and highway-legal vehicles would have access to all roads identified as open in the forest-wide EIS.

***The Proposed Action motorized use areas include*:**

In support of the proposed Class I network, four staging areas and two trailheads are proposed along the west half of the ATV route (west of the class II network), while two staging areas and one trailhead are proposed along the east half of the ATV route (east of the class II network). Proposed staging area locations include: Ochoco Divide Snow Park, Ahalt Mineral Source, Walton Snow Park, Scott's Mineral Source, Aspen Mineral Source and Road 600. Proposed trailhead access points include: Road 350 south of Indian Butte, road 550 at Allen Creek and Road 500 north of Jones Lava. Class I staging areas and trailheads would also be available for use by motorcycles (Class I and III).

In support of the proposed Class II network, two staging areas and three trailheads are proposed along the designated route. Class II staging areas and trailheads are distributed in order to provide access to a variety of terrain features and camp sites. Staging area locations include: Peterson Lava and Ross/Peterson ridge. Proposed trailhead access points include: East Porter Creek, Looney/Porter lava and Scott's Camp Mineral Source. Class II staging areas would also be available for use by ATVs and motorcycles (Class I, II and III).

In support of the proposed Class III network, two staging areas are proposed along the motorcycle-only route. Staging area locations include: Cottonwood Pit Mineral Source and Six Corners Mineral Source. Trails out of these staging areas would only be available for use by motorcycles (Class III only).

***Amenities*:**

Under the Proposed Action staging areas would provide amenities to support the intended use for each specific area. All staging areas would include at least one vault toilet, a picnic table and a kiosk or sign board with informational/directional signs and maps. Site specific amenities for each staging area are as follows:

- Ochoco Divide Snow Park would retain existing level of facilities (paved parking area, one vault toilet and a sign board). The objective for this staging area would be to provide access for trail users who travel/camp in recreational vehicles that are generally self-

contained and require little additional amenities. This staging area would include a simple warm-up or learner loop, and would generally be an entry point for visitors planning to travel eastward on the trail.

- Ahalt Mineral Source would be improved to support ATV and motorcycle staging. The objective for this area would be to provide for use by trail riders with a range of experience levels, for day or overnight use, for play area and/or for trail access. Amenities that would be needed include at least two vault toilets, defined and hardened camp sites, play area boundary markers, supervised youth rider area (markers or fence), picnic tables and sign boards.
- Walton Snow Park would be improved to support ATV and motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. Amenities that would be added include one more vault toilet, picnic tables and sign boards (near the existing toilet) and directional signing to keep users headed north from the staging area.
- Scott's Mineral Source would be improved to support ATV and motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a simple warm-up or learner loop, but would generally be intended to be an entry point for visitors planning to travel the east/west trail corridor. Amenities that would be added include at least one vault toilet, defined camp sites, picnic tables, sign boards and directional signing to lead riders onto the trail out of the staging area.
- Aspen Mineral Source would be improved to support ATV and motorcycle staging. The objective for this area would be to provide for use by trail riders with a range of experience levels, for day or overnight use, for play area and/or for trail access. Amenities that would be needed include at least one vault toilet, defined camp sites, play area boundary and hazard markers, supervised youth rider area (markers or fence), picnic tables and sign boards.
- Road 600 Staging Area would be improved to support ATV and motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a simple warm-up or learner loop, but would generally be intended to be an entry point for visitors planning to travel north. Amenities that would be added include at least one vault toilet, defined camp sites, picnic tables, sign boards and directional signing to lead riders onto the trail out of the staging area.
- Peterson Lava would be improved to support class II vehicle (jeep, etc) staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a short rock crawl loop (easy to moderate), but would generally be intended to be an entry point for visitors planning to travel throughout the class II area, or south on the jeep trail. Amenities that would be added include at least one vault toilet, defined camp sites, picnic tables, sign boards, haz-mat supply, and directional signing.
- Ross/Peterson ridge would be improved to support class II staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would provide an entry point for visitors planning to travel throughout the class II area, or quick access to the south end of the jeep trail. Amenities that would be added include a hardened parking area, at least one vault toilet, defined camp sites, picnic tables, sign boards, haz-mat supply, and directional signing.

- Cottonwood Pit Mineral Source would retain existing level of facilities but would serve as a motorcycle staging area. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a warm-up or learner loop and supervised youth riding area, but would generally be intended to be an entry point for visitors planning to travel east or west on the single-track trail loop. Amenities that would be added include a hardened parking area, picnic tables and sign boards (near the existing toilet) and directional signing to lead users to the trails out of the staging area.
- Six Corners Mineral Source would be improved to support motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a warm-up or learner loop and a supervised youth riding area, but would generally be intended to be an entry point for visitors planning to travel the single-track trail loop. Amenities that would be added include at least one vault toilet, defined camp sites, picnic tables, supervised youth rider area markers or fence, sign boards and directional signing to lead riders onto the trail out of the staging area.

Throughout the area, trailheads would remain as dispersed camp sites without developed recreation amenities such as toilets and picnic tables. Trailhead markers with informational signboards would be installed at mapped trailhead locations. At these locations hardening of surfaces for camp sites, turn-arounds and parking areas, and defining of campsites, would occur as needed. Other dispersed camp sites do occur along the trail that will not be mapped, these camp sites will generally not be modified, but trail routes passing by these sites would have directional signs and entrance filters (entrance devices to control vehicle size) installed, and camp sites defined as needed.

Selected locations along proposed trails would be improved to provide opportunities for sight-seeing, interpretive signing, rest/regroup areas and trail-side picnics. These locations would be at scenic viewpoints, points of interest, shady spots, etc. Improvements would be limited to picnic tables and/or benches and interpretive signing.

Non-Significant Amendments to Forest Plan

Alternative 2 includes three site-specific amendments to the Ochoco Land and Resource Management Plan. Each of these is related to designation of motorized crossings in Old Growth Management Areas (MA-F6) allocated in the 1989 LRMP other than on constant service roads (4-232, 4-234):

1. Old Growth Management Area (OG-D1-08) at Indian Butte to include motorized recreation only on designated routes including one new crossing to connect between roads 2200-306 and 2200-309.
2. Old Growth Management Area (OG-D1-12) at East Porter to include motorized recreation only on designated routes including one new crossing at Looney Creek to connect between roads 4200-430 and 4200-440.
3. Old Growth Management Area (OG-D2-1) near Chamberlin Spring to include motorized recreation only on designated routes including one crossing on closed road 4250-700 to connect between roads 4250-610 and 1200-440.
4. Old Growth Management Area (OG-D2-02) near Deep Creek to include motorized recreation only on designated routes including one new crossing.

What would it mean not to meet the need?

The Forest Plan describes an objective for off-road vehicles (ORVs): ORV use, and trail construction and reconstruction, will be allowed where they are not in conflict with other resource

objectives. Routes will be identified on the Forest to encourage use in specific areas by offering a variety of challenges and terrain (Forest Plan page 4-23). The Forest Plan (page 4-25) also provides a desired future condition of off-road vehicle use being directed to and encouraged on designated routes that will be developed, and describes a target of developing 190 miles of trail intended for motorized recreation (Forest Plan page 4-24). Not implementing an action alternative would mean forgoing these Forest Plan objectives and desired future conditions at this time. Motorized recreationists who use non-street legal vehicles would be restricted to the 8-mile Green Mountain Trail (authorized for use by class I and III vehicles only) and mixed use roads as designated in the Motor Vehicle Use Map. Opportunities for closing and rehabilitating some portions of user-created trails would not be realized at this time, nor would opportunities for reconstructing some user-created trails with sound design criteria. It is impossible to predict levels of unauthorized use, but it is anticipated that some people would continue to use motorized off-road vehicles in spite of the Travel Management decision. Not implementing an action alternative would forgo the opportunity to create a trail system for legal and authorized off-highway vehicle use.

Construction and seasonal use of a motorized vehicle trail system would have effects on the human environment, as described in the section titled "What are the effects of the alternatives" in this Summary. Not implementing an action alternative would mean not creating the potential to create environmental effects with this project.

Are there other alternatives that would meet the need?

Two action alternatives were developed in addition to the proposed action.

ALTERNATIVE 3

Alternative 3 offers many of the features described for Alternative 2 with the following exceptions (see Maps 5 and 6):

- Motorized trails would be open for use by specified vehicle type, seasonally between June 1 and September 30 of each year, except on Paulina Ranger District, where trails would close at the earlier date of September 30 or the beginning of the restriction period specified for the Rager Cooperative Travel Management Area, and would remain closed until June 1 of each year.
- The motorcycle (Class III) loop trail does not include the side loop in the Derr and upper Jackson Creek area that was in the Proposed Action. It also does not include the staging area or associated trails at Forest Road 4200-600, or the staging and play areas and associated trails at and around Aspen Pit compared to Alternative 2. It also does not include the staging area at Peterson Lava or any of the trailheads from Alternative 2.
- Compared to the Alternative 2: the class I staging and parking areas at Ahalt Pit are not included; the singular (there-and-back) ATV (class II) route between Indian Butte (at Forest Road 2200-350) and Scott's camp is not included; and none of the trailheads are included in this alternative.
- Alternative 3 does not include designated trails or staging areas for class II vehicles (jeeps and buggies).

The Alternative maps show where the proposed routes and supporting areas are located and how the routes overlay existing soil disturbance as identified by the presence of existing NFS roads. Refer to the legend for route color codes: existing disturbance is shown by the two colors used to display roads (orange, green). The Alternative maps also display quality of user experience as determined by whether the proposed route provides potential for trail features (narrow, winding,

challenging) or whether it falls on an open road (easy travel, easy access, mixed traffic). Refer to the legend for route color codes: road-to-trail conversions are proposed on closed or decommissioned roads (green), while new trail construction is proposed on route segments that are not on NFS roads (blue). Routes on open mixed use roads are shown in orange.

Trails would be designed with width and difficulty appropriate for each intended vehicle type, while roads designated as open in the forest-level Travel Management EIS would not be narrowed to trail standards (ie. designated open roads would remain designated open roads). Trail widths would be based on intended vehicle types, which are also displayed on Maps 5 and 6. Refer to the legend for vehicle types I and III. Motorcycle-only trails (single track) would be designed for 24" wide clearance and are displayed on the maps as a dashed line. Only single track vehicles would be allowed on single track trails (ie. no ATVs or 4x4s). All-terrain vehicle (ATV) trails would be designed for 50" wide clearance and are displayed as a dotted line on the maps. ATV trails would be available for use by ATVs and motorcycles but not 4x4s or side-by-side buggies. Alternative 3 does not include designated trails for class II vehicles (jeeps and buggies).

This project does not propose to change roads that would be open or closed to motorized access under the forest-level Travel Management EIS. The routes shown on these maps include proposed trails (approximately 88 miles) as well as about 13 miles of interconnected roads that are designated for mixed use by highway legal and non-highway legal vehicles (OHVs and passenger cars/trucks). The open roads are not changed from the forest-level EIS, but are shown on the Alternative 3 map as they serve as connectors between trail segments, or they enhance loop opportunities/options for trail users.

***Alternative 3 trail network includes*:**

In contrast to Alternative 2, this alternative includes two discrete riding areas for class I and III (ATVs and motorcycles) that are separated by an area without designated trails:

- A single track (class III) loop between Peterson Lava and Six Corners that incorporates some of the proposed jeep trail route locations from the Proposed Action alternative. This alternative does include one of the central tie-through trails between Paulina Butte and Jackson Creek. This alternative does retain staging areas at both Cottonwood Pit and Six Corners Mineral Source and their associated amenities.
- A series of interconnected 50" trails (class I and III) and loops between Ochoco Divide Snow Park, Walton Snow Park and road 2200-350 are included. Additional loops on the west end are included compared to the Proposed Action in order to provide adequate trail miles within a more compact area, multiple decision points and alternate loop options. Staging areas at Ochoco Divide Snow Park and Walton Snow Park are included in this alternative.

***The Alternative3 motorized use areas include*:**

In support of the proposed Class I network, two staging areas are proposed along the ATV route (in the west end of the analysis area). Proposed staging area locations include: Ochoco Divide Snow Park and Walton Snow Park. Class I staging areas would also be available for use by motorcycles (Class III).

In support of the proposed Class III network, two staging areas are proposed along the motorcycle-only route. Staging area locations include: Cottonwood Pit Mineral Source and Six Corners Mineral Source. Trails out of these staging areas would only be available for use by motorcycles (Class III only).

***Amenities*:**

Under Alternative 3 staging areas would provide amenities to support the intended use for each specific area. All staging areas would include at least one vault toilet, a picnic table and a kiosk or sign board with informational/directional signs and maps. Site specific amenities for each staging area are as follows:

- Ochoco Divide Snow Park would retain existing level of facilities (paved parking area, one vault toilet and a sign board). The objective for this staging area would be to provide access for trail users who travel/camp in recreational vehicles that are generally self-contained and require little additional amenities. This staging area would include a simple warm-up or learner loop, and would generally be an entry point for visitors planning to travel eastward on the trail.
- Walton Snow Park would be improved to support ATV and motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. Amenities that would be added include one more vault toilet, picnic tables and sign boards (near the existing toilet) and directional signing to keep users headed north from the staging area.
- Cottonwood Pit Mineral Source would retain existing level of facilities but would serve as a motorcycle staging area. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a warm-up or learner loop and supervised youth riding area, but would generally be intended to be an entry point for visitors planning to travel east or west on the single-track trail loop. Amenities that would be added include a hardened parking area, picnic tables and sign boards (near the existing toilet) and directional signing to lead users to the trails out of the staging area.
- Six Corners Mineral Source would be improved to support motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a warm-up or learner loop and a supervised youth riding area, but would generally be intended to be an entry point for visitors planning to travel the single-track trail loop. Amenities that would be added include at least one vault toilet, defined camp sites, picnic tables, supervised youth rider area markers or fence, sign boards and directional signing to lead riders onto the trail out of the staging area.

Dispersed camp sites do occur along the trail that will not be mapped, these camp sites will generally not be modified, but trail routes passing by these sites would have directional signs and entrance filters (entrance devices to control vehicle size) installed, and camp sites defined as needed. Camping would be allowed as in dispersed camp sites as allowed in the current Travel Management Plan. Selected locations along proposed trails would be improved to provide opportunities for sight- seeing, interpretive signing, rest/regroup areas and trail-side picnics. These locations would be at scenic viewpoints, points of interest, shady spots, etc. Improvements would be limited to picnic tables and/or benches and interpretive signing.

Non-Significant Amendments to Forest Plan

Alternative 3 includes two site-specific amendments to the Ochoco Land and Resource Management Plan. Each of these is related to designation of motorized crossings in Old Growth Management Areas (MA-F6) allocated in the 1989 LRMP other than on constant service roads (4-232, 4-234):

1. Old Growth Management Area (OG-D1-08) at Indian Butte to include motorized recreation only on designated routes including one new crossing to connect between roads 2200-306 and 2200-309.

2. Old Growth Management Area (OG-D1-12) at East Porter to include motorized recreation only on designated routes including one new crossing at Looney Creek to connect between roads 4200-430 and 4200-440.
3. Old Growth Management Area (OG-D2-02) near Deep Creek to include motorized recreation only on designated routes including one new crossing.

ALTERNATIVE 4

Alternative 4 offers the same features described for Alternative 2, but over a slightly larger area, with more trail miles and fewer supporting facilities such as trailheads (see Maps 7 and 8).

The Alternative 4 maps show where the proposed routes and supporting areas are located and how the routes overlay existing soil disturbance as identified by the presence of existing NFS roads. Refer to the legend for route color codes: existing disturbance is shown by the two colors used to display roads (orange, green). The Alternative maps also display quality of user experience as determined by whether the proposed route provides potential for trail features (narrow, winding, challenging) or whether it falls on an open road (easy travel, easy access, mixed traffic). Refer to the legend for route color codes: road-to-trail conversions are proposed on closed/decommissioned roads (green), while new trail construction is proposed on route segments that are not on NFS roads (blue). Routes on open mixed use roads are shown in orange.

Trails would be designed with width and difficulty appropriate for each intended vehicle type, while roads designated as open in the forest-level Travel Management EIS would not be narrowed to trail standards (i.e. designated open roads would remain designated open roads). Trail widths would be based on intended vehicle types, which are also displayed on Maps 7 and 8. Refer to the legend for vehicle types I, II and III. Motorcycle-only trails (single track) would be designed for 24” wide clearance and are displayed on the maps as a dashed line. Only single track vehicles would be allowed on single track trails (i.e. no ATVs or 4x4s). ATV trails would be designed for 50” wide clearance and are displayed as a dotted line on the maps. ATV trails would be available for use by ATVs and motorcycles but not 4x4s or side-by-side buggies. Class II trails would be designed for 80” wide clearance and are displayed on the maps as a line with cross bars. Class II trails would be available for use by any vehicle with an outside maximum width of less than 80” (jeeps, ¼ ton trucks and SUVs, side-by-side buggies, rock crawlers, etc.)

This project does not propose to change roads that would be open or closed to motorized access under the forest-level Travel Management EIS. The routes shown on these maps include proposed trails (approximately 158 miles) as well as about 53 miles of interconnected roads that are designated for mixed use by highway legal and non-highway legal vehicles (OHVs and passenger cars/trucks). The open roads are not changed from the forest-level EIS, but are shown on the Proposed Action map as they serve as connectors between trail segments, or they enhance loop opportunities/options for trail users.

***The Alternative 4 trail network includes*:**

Similar to the Proposed Action this alternative features several interconnected trail systems:

- Class I network includes a series of shorter interconnecting loops, offering numerous decision points, on the west end. This portion of the ATV network would be served by 4 staging areas (Ochoco Divide, Ahalt, Walton and Allen Creek). In the east central part of the project area there would be a moderate size loop generally east of the Jeep area and west of the motorcycle loops, served by two staging areas (Happy Camp/Double Corral ridge, and 4200-600 mineral source. This central loop could be ridden entirely without entering the jeep area, but ATV and motorcycle riders could choose to use the jeep trails being provided three legal points of access.

- Class II network would include a series of 80” trails created by a combination of new construction and road-to-trail conversion, served by two staging areas and one trailhead. These trail segments would be connected with the minimal amount of open mixed use road necessary to get from one staging area to the other, and to connect from one discrete trail segment to the next. Though other alternate loop options would remain available on mixed use roads, these extra opportunities would not be included in the system of designated routes and would not be managed as designated routes. Camp areas would be within 300’ of open roads and would not have exclusive use by class II vehicles. All 80” trails would be available to any rubber tired vehicle with a maximum width of 80”, though some routes would be posted as not recommended for certain vehicle types.
- Class III network would include a series of interconnected loops ranging from short to long, offering numerous decision points. The motorcycle only network would be served by two staging areas (Six Corners and Cottonwood Pit). The motorcycle only network would interconnects with the central ATV system, providing more options for class III riders without having to enter the jeep area. Class III vehicles could use the entire system of trails if they choose to do so, however they could also travel from the west end to the east end without having to travel on a class II trail. However, to do so they would have to make connections between the west end network and the central /eastern networks on mixed used road 2630 and 2630-750 or 2630-800.

***The Alternative 4 motorized use areas include*:**

In support of the proposed Class I network, four staging areas are proposed along the west half of the ATV route (west of the class II network), while two staging areas are proposed along the east half of the ATV route (east of the class II network). Proposed staging area locations include: Ochoco Divide Snow Park, Ahalt Mineral Source, Walton Snow Park, Scott’s Mineral Source, Aspen Mineral Source and Road 600. Class I staging areas would also be available for use by motorcycles (Class I and III).

In support of the proposed Class II network, two staging areas are proposed along the designated route. Class II staging areas are distributed in order to provide access to a variety of terrain features and camp sites. Staging area locations include: Peterson Lava and Ross/Peterson ridge. Class II staging areas would also be available for use by ATVs and motorcycles (Class I, II and III).

In support of the proposed Class III network, two staging areas are proposed along the motorcycle-only route. Staging area locations include: Cottonwood Pit Mineral Source and Six Corners Mineral Source. Trails out of these staging areas would only be available for use by motorcycles (Class III only).

***Amenities*:**

Under the Proposed Action staging areas would provide amenities to support the intended use for each specific area. All staging areas would include at least one vault toilet, a picnic table and a kiosk or sign board with informational/directional signs and maps. Site specific amenities for each staging area are as follows:

- Ochoco Divide Snow Park would retain existing level of facilities (paved parking area, one vault toilet and a sign board). The objective for this staging area would be to provide access for trail users who travel/camp in recreational vehicles that are generally self-contained and require little additional amenities. This staging area would include a simple warm-up or learner loop, and would generally be an entry point for visitors planning to travel eastward on the trail. Amenities that would be needed include sign boards and directional signing.

- Ahalt Mineral Source would be improved to support ATV and motorcycle staging. The objective for this area would be to provide for use by trail riders with a range of experience levels, for day or overnight use, for play area and/or for trail access. Amenities that would be needed include at least two vault toilets, defined and hardened camp sites, play area boundary markers, riding area where youth could be supervised (markers or fence), picnic tables, sign boards and directional signing.
- Walton Snow Park would be improved to support ATV and motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. Amenities that would be added include one more vault toilet, picnic tables and sign boards (near the existing toilet) and directional signing to keep users headed north from the staging area.
- Scott's Mineral Source would be improved to support ATV and motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a simple warm-up or learner loop, but would generally be intended to be an entry point for visitors planning to travel the east/west trail corridor. Amenities that would be added include at least one vault toilet, defined camp sites, picnic tables, sign boards and directional signing to lead riders onto the trail out of the staging area.
- A staging area approximately 1 mile east of Aspen Mineral Source (near FS Road 30/850) would be improved to support ATV and motorcycle staging. The objective for this area would be to provide for use by trail riders with a range of experience levels, for day or overnight use, for trail access. Amenities that would be needed include at least one vault toilet, defined camp sites, a simple warm-up or learner loop, picnic tables, sign boards and directional signing.
- Road 600 Staging Area would be improved to support ATV and motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a simple warm-up or learner loop, but would generally be intended to be an entry point for visitors planning to travel north. Amenities that would be added include at least one vault toilet, defined camp sites, picnic tables, sign boards and directional signing to lead riders onto the trail out of the staging area.
- Peterson Lava would be improved to support class II vehicle (jeep, etc) staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a short rock crawl loop (easy to moderate), but would generally be intended to be an entry point for visitors planning to travel throughout the class II area, or south on the jeep trail. Amenities that would be added include at least one vault toilet, defined camp sites, picnic tables, sign boards, haz-mat supply, and directional signing.
- Ross/Peterson ridge would be improved to support class II staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would provide an entry point for visitors planning to travel throughout the class II area, or quick access to the south end of the jeep trail. Amenities that would be added include a hardened parking area, at least one vault toilet, defined camp sites, picnic tables, sign boards, haz-mat supply, and directional signing.
- Cottonwood Pit Mineral Source would retain existing level of facilities but would serve as a motorcycle staging area. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a warm-up or learner loop and riding area where youth could be supervised, but would generally be intended to be

an entry point for visitors planning to travel east or west on the single-track trail loop. Amenities that would be added include a hardened parking area, picnic tables and sign boards (near the existing toilet) and directional signing to lead users to the trails out of the staging area.

- Six Corners Mineral Source would be improved to support motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a warm-up or learner loop and a riding area where youth could be supervised, but would generally be intended to be an entry point for visitors planning to travel the single-track trail loop. Amenities that would be added include at least one vault toilet, defined camp sites, picnic tables, supervised youth rider area markers or fence, sign boards and directional signing to lead riders onto the trail out of the staging area.

Dispersed camp sites that occur along the trail will not be mapped; these camp sites generally will not be modified, but trail routes passing by these sites would have directional signs and entrance filters (entrance devices to control vehicle size) installed, and camp sites defined as needed. Camping would be allowed as in dispersed camp sites as allowed in the current Travel Management Plan. Selected locations along proposed trails would be improved to provide opportunities for sight- seeing, interpretive signing, rest/regroup areas and trail-side picnics. These locations would be at scenic viewpoints, points of interest, shady spots, etc. Improvements would be limited to picnic tables and/or benches and interpretive signing.

Non-Significant Amendments to Forest Plan

Alternative 4 includes three site-specific amendments to the Ochoco Land and Resource Management Plan. Each of these is related to designation of motorized crossings in Old Growth Management Areas (MA-F6) allocated in the 1989 LRMP other than on constant service roads (4-232, 4-234):

1. Old Growth Management Area (OG-D1-08) at Indian Butte to include motorized recreation only on designated routes including one new crossing to connect between roads 2200-306 and 2200-309.
2. Old Growth Management Area (OG-D1-12) at East Porter to include motorized recreation only on designated routes including one new crossing at Looney Creek to connect between roads 4200-430 and 4200-440.
3. Old Growth Management Area (OG-D2-1) near Chamberlin Spring to include motorized recreation only on designated routes including one crossing on closed road 4250-700 to connect between roads 4250-610 and 1200-440.
4. Old Growth Management Area (OG-D2-02) near Deep Creek to include motorized recreation only on designated routes including one new crossing.

What are the effects of the alternatives?

The following table summarizes a comparison of the four alternatives.

Parameter	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Total miles in Designated System Routes (including mixed-use roads)	0	170	101	212
Total miles of OHV trail	0	124	88	158
Miles of Class I Trail	0	55	35	95
Miles of Class II Trail	0	20	0	18
Miles of Class III Trail	0	49	53	45

Parameter	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Miles of trail not on GIS roads ("new construction")	0	69	50	84
Number of Dispersed Campsites within which OHV noise from the developed trail system might be greater than 45 db	0	35	18	37
Miles of Dispersed Camping Roads within the >45 db noiseband	0	65	26	73
Miles of Equestrian Endurance Event Route within the >45 db noiseband	0	1.89	1.46	2.12
Miles of Keeton Trail within the >45 db noiseband	0	0.03	0.02	0.02
Number of Developed Campgrounds within which OHV noise from the developed trail system might be greater than 45 db	0	4	4	5
Acres of Roaded Modified Recreation Opportunity Spectrum within the >45 db noiseband	0	10,837	5,818	12,771
Acres of Roaded Natural Recreation Opportunity Spectrum within the >45 db noiseband	0	1,668	1,059	2,220
Acres of Semiprimitive Non-Motorized Recreation Opportunity Spectrum within the >45 db noiseband	0	276	117	292
Miles of trail system in RHCA	0	18	7	22
Total creek/wetland crossings	0	142	62	170
Class 1 & 2 riparian crossings	0	27	16	27
Class 3 riparian crossings	0	4	5	11
Class 4 riparian crossings	0	76	34	92
Class 9 riparian crossings	0	35	7	40
Increased motorized route density – 6th Field (number of subwatersheds in the analysis area)	0	11 of 30	9 of 30	13 of 30
Acres USFS more than ½ mi from motorized route	50,177 (16%)	44,374 (15%)	45,148 (15%)	43,085 (15%)
Acres USFS less than 200 m from motorized route	115,127 (38%)	125,745 (42%)	123,036 (41%)	129,390 (43%)
Acres of elk security habitat (½ mi + 250 ac)	47,969 (16%)	42,460 (14%)	42,514 (14%)	41,132 (14%)
Acres of big game hiding cover (> ½ mi from motorized route)	11,847	11,558	11,465	11,285
Acres of big game thermal cover (> ½ mi from motorized route)	9,197	9,089	8,978	8,915
Total big game cover (> ½ mi from motorized route)	21,044	20,647	20,443	20,200
Miles of system within 660' of hawk/owl nest	0	0.25	0	0
Miles of system within ¼ mi of osprey nest	0	0.6	0.46	0.46
Miles of system within ¼ mi of goshawk nest	0	2.95	1.46	2.78
Miles of system within goshawk post-fledging area	0	5.98	4.13	6.7

Parameter	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Miles of system within Old Growth Management Areas	0	2.59	1.44	2.54
Miles of system within mapped pileated woodpecker feeding habitat	0	2.82	0.68	2.85
Acres and miles of designated trail system in special habitat (Hardwood)	0 acres 0 miles	0.6 acres 0.5 miles	0.6 acres 0.5 miles	0.6 acres 0.5 miles
Acres and miles of designated trail system in special habitat (Meadow)	0 acres 0 miles	2.4 acres 2.02 miles	2.5 acres 2.1miles	4.1 acres 3.35 miles
Acres and miles of designated trail system in special habitat (Rock)	0 acres 0 miles	1.3 acres 1.1 miles	0.7 acres 0.6 miles	1.6 acres 1.3 miles
Acres and miles of designated trail system in special habitat (Shrub-scabland)	0 acres 0 miles	29.1 acres 24.0 miles	10.8 acres 8.9 miles	33.2 acres 27.4 miles
Crossings with highway legal only roads	0	20	16	23
Rehab/Restore sites - user created routes	0	89	54	106
Rehab/Restore sites - decommissioned roads	0	11	7	8
Rehab/Restore sites – closed roads	0	109	84	163
Estimated Construction Cost	0	$978,500	$759,000	$1,071,000

Alternative 4 would provide the most extensive designated trail system for motorized recreation; class I, II and III vehicles would be accommodated. Alternative 3 would provide the least extensive trail system of the action alternatives and would not accommodate class II vehicles. Alternative 2 would provide a more extensive trail system than Alternative 3, and would accommodate class I, II and III vehicles.

Recreationists who prefer non-motorized activities may be disturbed by the sounds of OHVs. Generally, Alternative 4 would create the most opportunity for noise disturbance to non-motorized recreationists and other forest visitors, and Alternative 3 would create the least.

Map 9 displays watershed boundaries in the project area. Trails in Riparian Habitat Conservation Areas (RHCAs; see Map 10) and trail crossings over streams can contribute sediment to stream systems, particularly at localized, sensitive areas as described in the Hydrology and Aquatic Species sections of the draft EIS. Riparian vegetation may be removed at stream crossing locations. Increased sedimentation may decrease spawning success of salmonid fish. Reduced vegetation may result in localized areas of reduced stream shade. Motorized vehicles crossing wet areas during the spotted frog reproductive season may disrupt the reproductive cycle for this species. Alternative 4 has the most miles of trail in riparian areas and the highest number of stream crossings; Alternative 3 has the least miles of trail in riparian areas and the lowest number of stream crossings.

All action alternatives may decrease habitat effectiveness for big game (elk and mule deer). Each action alternative would designate trail system within the habitat of a variety of wildlife species, effects are generally related to human disturbance and sound, rather than measurable direct physical impacts to habitat. Each action alternative would increase motorized route density within some subwatersheds; Alternative 4 would increase motorized route density in the most subwatersheds, and Alternative 3 in the least.

Each action alternative proposes to restore/rehabilitate currently disturbed areas. Overall, Alternative 4 proposes the most restoration and Alternative 3 the least.

Alternative 4 would cost the most money to implement, and Alternative 3 would cost the least.

What factors would be used in making the decision between alternatives?

The Responsible Official for this proposal is the Forest Supervisor of the Ochoco National Forest. The Responsible Official will decide whether to:

- Select the proposed action;
- Select an action alternative that has been considered in detail;
- Modify and an action alternative;
- Select the no action alternative;
- Identify what mitigation measures and monitoring will apply.

The decision will be determined by how well each alternative provides the best mix of prospective results in regard to the purpose and need, the significant issues, and public comments.

What monitoring is necessary?

The following monitoring is included in all action alternatives:

Soil and Water Quality

- Implementation monitoring and Water Quality monitoring to evaluate the effectiveness of BMPs and INFISH standards and guidelines is included for all the action alternatives.
- Drainage would be monitored prior to opening of the trails to ensure that they are functional during operating season, and after the open season to ensure that they are fully functional going into the winter when the trail is not in use.
- Areas with high erosion potential would be monitored to determine whether design treatments intended to reduce erosion potential were implemented according to plans and that they are effective in achieving desired outcomes. Possible methods include establishment of long term photo points or transects in selected sites to monitor changes in soil depth, displacement and compaction.
- The alternatives include several design elements aimed at reducing the potential for sediment delivery from trails in RHCAs and at stream approaches. Selected reaches would be monitored to evaluate changes in sediment. Baseline water quality data for normal conditions would be established at selected sites, and would be used as a basis from which to measure change. Water quality standards and the amount of acceptable change would be identified. Monitoring would occur along stream courses, springs, wet meadows, and RHCAs to determine whether project design elements were implemented as planned and whether they are effective in meeting protection needs.
- Unauthorized or unwanted user created routes that are closed or decommissioned under this project would be monitored to determine if effective ground cover has become established in order to minimize erosion and sedimentation.

Invasive Plant Species

- High priority areas such as sensitive plant populations, rare habitats, staging areas and parking areas would receive regular monitoring and prevention for invasive plant species presence. If noxious weeds are found, an early detection rapid response strategy for treatment of weeds would be implemented.

Wildlife

- Although no trail systems have been designed to overlap existing known bald eagle nest sites or Bald Eagle Management Areas (BEMAs), periodic monitoring of selected bald eagle nest sites would continue to occur within the analysis area as part of the wildlife monitoring program.
- Although no trail systems have been designed to overlap existing known goshawk core areas or primary zones for other raptors, periodic monitoring of selected raptor nest sites would continue to occur within the project's area of influence as part of the wildlife monitoring program.
- Monitoring and enforcement of system route closures within the Rager Cooperative Travel Management Area would occur. The focus would be during hunting season and would emphasize patrols within the TMA.
- Periodic monitoring of designated routes through special wildlife habitats such as elk calving areas, old growth management areas, pileated woodpecker foraging habitat and goshawk post fledging areas would be conducted to determine if unauthorized or user created routes are developing in a fashion that connects with the designated route. If such unwanted, unauthorized or user created routes are detected then steps would be taken to close, rehabilitate and/or conceal such routes at their intersection with the designated route and at their point of origin.

Range

- As part of a routine maintenance program, monitoring of all fences that are crossed by a designated route would occur during and after trail construction and route designation and periodically after implementation to determine effectiveness and needs for maintenance or repair.
- Monitoring of all water developments that are within ¼ mile of a designated route, trailhead or staging area would occur during and after trail construction and route designation and periodically after implementation to determine if unauthorized routes have developed which need to be closed.
- Monitoring of range designated monitoring areas (DMAs) that are within ¼ mile of a designated route, trailhead or staging area would occur during and after trail construction and route designation and periodically after implementation to determine if unauthorized routes have developed that need to be closed.

Cultural Resources and Site Monitoring Plan

- Monitoring of all sites that are crossed by, or adjacent to, a designated route would occur during and after trail construction and route designation. Following implementation, site visits would occur periodically to ensure that integrity of these sites is being maintained. This would be coordinated by the District or Forest Archaeologist.

Road Management and Public Safety

- The Road Manager(s) would be responsible for monitoring the condition of designated mixed use routes and crossings of open roads, addressing items that may need corrective action associated with timing of maintenance and public safety. Visibility related to adequate sight distance on curves and at intersections and adequate signing would be the focus.

Recreation

- Monitoring would be conducted by Central Oregon Off-Highway Vehicle Operations (COHVOPS) which incorporates agency personnel and volunteers into an integrated education and enforcement program that monitors elements such as sound testing at staging areas and key locations, and rules related to camping and use of the trail system.
- Trail management would include implementation monitoring of trail construction (including all design elements), type(s) of vehicle accessing each trail area and season of use.
- For conversion of road beds to trails, monitoring would be conducted to determine if widths in excess of trail width specifications were adequately rehabilitated with effective ground cover or width controlling devices such as logs or boulders.
- Trails would be monitored annually to determine if improvements need to be made to support intended use and compliance with trail rules.
- Trail Condition Surveys would be conducted annually to determine if repair or restoration needs have arisen. Monitoring would be done both before the trails open for public use in the spring and throughout the open season. These surveys also include checking to determine if unauthorized or user created trails have developed that need to be addressed.
- Stationary sound testing (Society of Automotive Engineers (SAE Standard J1287) of vehicle dB levels would be conducted periodically at all staging areas.
- Ambient sound testing would be conducted periodically in selected areas (such as Walton Lake Basin) during the operating season to determine the effectiveness of the Sound Model and application of the 45 dB level for establishing sound impacts above ambient level.
- Monitoring of campsites at staging areas and trailheads would be conducted to determine if the camp areas are accommodating user needs, and to determine if camp sites need to be defined (placement of physical limits).
- Trail use would be monitored in selected locations via a combination of visual visitor counts at staging areas, traffic counters and trail counters.
- Implementation monitoring results would be available through the Forest Plan Monitoring Report. At the programmatic level, minimum trail plan monitoring would include an annual report of the following:
    - Miles of new trail constructed by user type
    - Miles of trail reconstruction by user type
    - Miles of trail maintained by user type
    - Miles of total trail that meet meaningful measure standards

Which alternative is preferred?

Based on the effects described in the draft EIS, the Responsible Official has selected Alternative 3 as the preferred alternative.

Table of Contents

Summary ..... **iii**
Why is the action being proposed? iii
What action is proposed? iii
What would it mean not to meet the need? vii
Are there other alternatives that would meet the need? viii
What are the effects of the alternatives? xiv
What factors would be used in making the decision between alternatives? xvii
What monitoring is necessary? xvii
Which alternative is preferred? xix

Chapter 1. Purpose of and Need for Action **1**
Document Structure 1
Background 1
Purpose and Need for Action 2
Forest Plan Direction and Other Guidance 3
Forest Plan Management Areas 4
INFISH 5
Proposed Action 6
Decision Framework 6
Public Involvement 7
Issues 8

Chapter 2. Alternatives, Including the proposed action **12**
Introduction 12
Alternatives Considered in Detail 12
Alternative 1 (No Action) 12
Alternative 2 (Proposed Action) 12
Alternative 3 17
Alternative 4 20
Other Information for all Action Alternatives 24
Resource Protection Measures 24
Project Design Criteria Common to All Action Alternatives 24
Mitigation Measures Common to All Action Alternatives 32
Monitoring 33
Alternatives Considered but Eliminated from Detailed Study 36
Comparison of Alternatives 37

Chapter 3. Affected Environment and Environmental Consequences **40**
Cumulative Effects 40
Transportation 44
Existing Condition 44
Environmental Effects 52
Recreation 61
Introduction 61
Existing Condition 67
Assumptions for the Effects Analysis 74
Environmental Effects 79
Geology 88
Existing Condition 88
Environmental Effects 90

Cumulative Effects 93
Soils 93
Management Direction 93
Existing Condition 95
Environmental Effects 96
Cumulative Effects 102
Hydrology 105
Pertinent Rules and Regulations 105
Analysis Design 109
Existing Condition 117
Environmental Effects 129
Cumulative Effects 174
Conclusion 181
Aquatic Species 185
Threatened, Endangered and Sensitive Species 185
Management Indicator Species 229
Wildlife 232
General Effects to Wildlife 232
Access for predators and people 233
Fragmentation of habitat patches 234
Behavioral changes in response to human use 236
Impacts due to noise 236
Physical Alteration of Habitat 239
Threatened, Endangered and Sensitive Species 240
Management Indicator Species (LRMP) 254
Other Wildlife Species (LRMP) 287
Land Birds 296
Botany 304
Introduction 304
Threatened, Endangered and Sensitive Plants 305
Non-native Invasive Plants 320
Special Plant Habitats 329
Cultural Resources 339
History 339
Management Direction 340
Desired Condition 340
Existing Condition 341
Direct and Indirect Effects 342
Cumulative Effects 344
Monitoring 345
Range Resources 345
Introduction 345
Environmental Effects 347
Cumulative Effects 352
Wilderness, Inventoried Roadless and Unroaded Areas 353
Visual Quality 354
Air Quality 354
Social and Economic Analysis 359
General Information and Population Estimates 359
Employment 362
Population Characteristics of OHV Users 363

Cost Estimates 365
Civil Rights and Environmental Justice 366
Short-term Uses and Long-term Productivity 367
Unavoidable Adverse Effects 367
Soils 368
Invasive Plants 368
Sedimentation/Turbidity 368
Irreversible and Irretrievable Commitments of Resources 369
Incomplete and Unavailable Information 370
Energy Requirements 370
Effects on Laws, Regulations, Plans, Policies, and Procedures 371
Part 212-Travel Management 371
National Forest Management Act 375
Endangered Species Act 377
Clean Water Act 377
Executive Orders 378

Chapter 4. Consultation and Coordination 382
Preparers and Contributors 382
References 385
Glossary 395
Index 409

Appendix A – Maps 411

List of Tables

Table 1. Summary of proposed motorized trails and areas, Alternative 2, Ochoco Summit Trail System project. 16
Table 2. Summary of proposed Ochoco Summit Trail System, Alternative 3, motorized trails and areas. 19
Table 3. Summary of proposed Ochoco Summit Trail System, Alternative 4, motorized trails and areas. 23
Table 4. Seasonal restrictions on trail construction and maintenance for active raptor nest sites. 30
Table 5. Comparison of alternatives. 37
Table 6. Past, present and reasonable foreseeable future actions. 41
Table 7. Miles of road by maintenance level. 47
Table 8. Road density for 5th and 6th order watersheds, all open roads, mi/mi^2 47
Table 9. Roads proposed for decommissioning under Howard, Johnson, Elliot and Porter Creek Subwatershed Roads Analysis. 49
Table 10. Roads proposed to for closure under the Howard, Johnson, Elliot and Porter Subwatersheds Roads Analysis. 49
Table 11. Roads proposed for closure or decommissioning under Deep Creek Roads Analysis and Deep Restoration Environmental Analysis. 51
Table 12. Roads proposed for closure under Spears Roads Analysis. 51
Table 13. Roads proposed for decommissioning under Spears Roads Analysis. 51
Table 14. Intersections between the alternative routes and highway legal only routes. 53
Table 15. Alternative 2 trail system, miles of existing road and new route by vehicle class. 54

Table 16. Alternative 2 (Proposed Action) crossing type for stream class and vehicle class. 54
Table 17. Alternative 3 Routes for Class I and Class III vehicles, miles. 55
Table 18. Alternative 3 Crossing Type for Stream Class and Vehicle Class. 55
Table 19. Alternative 4 Class I, Class II and Class III routes, miles. 56
Table 20. Alternative 4 Crossing Type for Stream Class and Vehicle Class. 56
Table 21. Alternative 2 road density open roads and proposed trails - subwatershed basis. 57
Table 22. Subwatersheds with Open Road and Trail Density at or above 3 miles/sq. mile in General Forest, Alternative 2 combined with closures proposed in other projects. 58
Table 23. Alternative 3 Road Density – Subwatershed (Mile/Square Mile). 58
Table 24. Subwatersheds with Open Road and Trail Density at or above 3 mi/sq. mi in General Forest, Alternative 3 combined with closures proposed in other projects. 59
Table 25. Alternative 4 Road Density - Subwatershed Basis. 60
Table 26. Subwatersheds with Open Road and Trail Density at or above 3 miles/sq. mile in General Forest, Alternative 4 combined with road closures proposed in other projects. 61
Table 27. 2008 Ochoco National Forest activity participation and primary activity (NVUM) and national user participation (NSRE) in comparable recreation activities. 63
Table 28. Secondary Activities Reported by Primary OHV Users in the Pacific Northwest Region of the Forest Service. 65
Table 29. Frequency of Motorized Trail Participation in Oregon among Households Reporting OHV Participation. 66
Table 30. OHV Ownership, Permits, In-state, by County, Percent of County Ownership by Class (Lindberg 2009). 66
Table 31. Developed recreation sites within the Ochoco Summit OHV Trail System project area. 68
Table 32. Selected OHV opportunities close to the Ochoco Summit project area. 70
Table 33. Trends in number of people participating and number of participation days for selected outdoor recreation activities in the United States, 1999-2008. 72
Table 34. Value of OHV experience by vehicle class based on miles of trail. 75
Table 35. Value of an OHV Area Based on Play Areas and Scenic View Points. 75
Table 36. Description of Staging and Camping Areas. 76
Table 37. Miles of OHV trail and assigned value by vehicle class by alternative. 81
Table 38. Riding areas and scenic viewpoints by alternative. 82
Table 39. Staging areas and trailheads by alternative. 82
Table 40. Site-specific staging area information by alternative. 83
Table 41. Decision points and opportunities near staging areas by alternative. 83
Table 42. Summary of trail miles proposed in Alternative 2 of the Ochoco Summit OHV Trail System project. 84
Table 43. Summary of trail miles proposed in Alternative 3 of the Ochoco Summit OHV Trail System project. 85
Table 44. Summary of trail miles proposed in Alternative 4 of the Ochoco Summit OHV Trail System project. 86
Table 45. Sites/Areas from which sounds of OHVs might be audible at > 45 db. 88
Table 46. Lithology across the Ochoco Summit OHV project area by watershed. 89
Table 47. Landslide terrain by subwatershed (acres) in the Ochoco Summit project area. 89
Table 48. Lithology for each proposed trail type in Alternative 2 of the Ochoco Summit project (acres). 91
Table 49. Acres of dormant and active landslide terrain for each trail type in all action alternatives of the Ochoco Summit project. 91
Table 50. Lithology for each proposed trail type in Alternative 3 of the Ochoco Summit project (acres). 92
Table 51. Lithology for each proposed trail type in Alternative 4 of the Ochoco Summit

project (acres). 93
Table 52. Effective ground cover objectives from the Ochoco Forest Plan (page 4-196). 94
Table 53. Major landtypes in the Ochoco Summit OHV project area (from Paulson, 1977, ONF SRI). 95
Table 54. Miles/acres of proposed trails by alternative. 101
Table 55. Riparian Management Objectives (INFISH 1995). 109
Table 56. Name and HUCs for subwatersheds not analyzed within the Ochoco Summit project boundary. 110
Table 57. Generalized sensitivity to disturbance and recovery potential by stream type (Rosgen 2009). 114
Table 58. Hydrologic Unit Codes for the Ochoco Summit project area. 117
Table 59. List of streams in the Ochoco Summit project area by watershed and subwatershed*. 118
Table 60. Stream class miles by watershed and subwatershed. 119
Table 61. Miles of perennial, intermittent, and ephemeral streams. 119
Table 62. Summary of existing condition in the Lower Beaver Creek Watershed. 121
Table 63. Summary of stream condition and impairments in North Wolf Creek Subwatershed. 122
Table 64. Summary of existing condition in the Upper North Fork Crooked River Watershed. 122
Table 65. Summary of stream condition and impairments in Elliot Creek Subwatershed. 123
Table 66. Summary of stream condition and impairments in Howard Creek Subwatershed. 124
Table 67. Summary of stream condition and impairments in Peterson Creek Subwatershed. 125
Table 68. Summary of stream condition and impairments in Porter Creek Subwatershed. 125
Table 69. Summary of existing condition in the Deep Creek Watershed. 126
Table 70. Summary of stream condition and impairments in Jackson Creek Subwatershed. 127
Table 71. Summary of stream condition and impairments in Little Summit Prairie Creek Subwatershed. 127
Table 72. Summary of stream condition and impairments in Lower Deep Creek Subwatershed. 128
Table 73. Summary of existing condition in the Upper Ochoco Creek Watershed. 128
Table 74. Summary of stream condition and impairments in Upper Marks Creek Subwatershed. 129
Table 75. Alternative 2 flow and sediment regime cumulative effects summary by watershed. 177
Table 76. Cumulative road/trail densities with implementation of future and ongoing projects. 178
Table 77. Cumulative stream crossing density with implementation of future and ongoing projects. 178
Table 78. Cumulative road/trail densities within 300 feet of streams with the implementation of future and ongoing projects. 179
Table 79. Cumulative road/trail densities within GDE RHCAs with the implementation of future and ongoing projects. 179
Table 80. Deep Creek Restoration Plan planned decommisioned roads converted to trail. 180
Table 81. Flow and sediment regime summary of direct/indirect effects by alternatives. 183
Table 82. Sediment and turbidity summary of direct/indirect effects by alternative. 184
Table 83. Specific locations with hydrologic concerns. 184

Table 84. Determination for threatened, endangered and sensitive aquatic species. 185
Table 85. Watersheds with proposed trail that do not impact streams, ponds, seeps or springs. 186
Table 86. Existing stream conditions in the Deep Creek Watershed. 192
Table 87. Summary of Effects of Alternative 2 to Aquatic Habitats. 205
Table 88. Alternative 3 impacts and measures. 214
Table 89. Summary of effects of Alternative 4. 224
Table 90. Current and foreseeable projects within the Ochoco Summit project area relative to cumulative effects to aquatic species. 228
Table 91. Comparison of Alternative Actions. 234
Table 92. Comparison of Alternatives, Acres within distance bands of motorized routes.. 235
Table 93. Acreage within and more than one mile from motorized routes in the Ochoco Summit project area. 238
Table 94. Regional TES Terrestrial Animal Species for the Ochoco National Forest. 240
Table 95. Bald eagle territories and historical nesting status 2002-2012 within Ochoco Summit project area. 244
Table 96. Summary of Conclusion of Effects to Region 6 Sensitive Animal Species. 254
Table 97. Ochoco National Forest Management Indicator Species. 255
Table 98. Annual Travel-generated estimated expenditures toward hunting and wildlife viewing in Crook and Wheeler Counties, Oregon (overnight or day trips 50+ miles one way, or non-residents). 263
Table 99. Annual Local estimated expenditures toward hunting and wildlife viewing in Crook and Wheeler Counties, Oregon (residents and day trips less than 50 miles one way). 263
Table 100. Numbers of deer hunters, hunter days and hunter success in the Ochoco Wildlife Management Unit (Years 2008-2009). 263
Table 101. April mule deer populations expressed as a percentage of the management objective (20,500) in the Ochoco Management Unit. 264
Table 102. Numbers of elk hunters, estimated population and hunter success in the Ochoco Wildlife Management Unit (Years 2008-2009). 264
Table 103. Winter elk populations expressed as a percentage of the management objective (4,600) in the Ochoco Management Unit. 265
Table 104. Total combined open motorized density of roads and trails expressed in miles per square mile, by alternative and watershed (National Forest System lands only) without mitigation. 271
Table 105. Subwatersheds with Open Road Density at or above 3 miles/sq. mile in General Forest, Alternative 1 combined with closures proposed in other projects. 272
Table 106. Acres of Elk Security Area Greater than ½ mile from any open motorized routes. 272
Table 107. Subwatersheds with Open Road and Trail Density at or above 3 miles/sq. mile in General Forest, Alternative 2 combined with closures proposed in other projects. 274
Table 108. Subwatersheds with Open Road and Trail Density at or above 3 mi/sq. mi in General Forest, Alternative 3 combined with closures proposed in other projects. 275
Table 109. Subwatersheds with Open Road and Trail Density at or above 3 miles/sq. mile in General Forest, Alternative 4 combined with road closures proposed in other projects. ... 278
Table 110. Comparison of Alternatives for Hiding and Thermal Cover (more than ½ mile from open motorized route and within 2 miles of private land). 281
Table 111. Summary Comparison of Key Indicators for Big Game by Alternative. 282
Table 112. Ochoco National Forest Other Species (LRMP). 287
Table 113. Comparison of Alternatives for Length of Trail in Potential Pronghorn Antelope Habitat. 288

Table 114. Reproductive History of Goshawks within the Ochoco Summit Analysis Area. 289
Table 115. Raptor Nest Buffer Impacts within the Ochoco Summit Analysis Area. 295
Table 116. Priority Habitat Features and Associated Focal Species for Northern Rocky Mountains Planning Unit, Blue Mountains Subprovince. 297
Table 117. Acres within 200 m (660') of any open road or trail. 298
Table 118. Estimate of acrest that would need to be cleared by action alternative for the Ochoco Summit OHV Trail System project. 303
Table 119. Summary of the prefield review for sensitive plants in the Ochoco Summit Project Area. 306
Table 120. Populations of sensitive species that occur, or are likely to occur, within the Ochoco Summit project area. 309
Table 121. COMAC routes within sensitive plant populations. 310
Table 122. Length of trail proposed within sensitive plant populations. 313
Table 123. Proposed trails within riparian sensitive species habitat, perennial streams. ... 314
Table 124. Trails proposed within scabland sensitive species habitat. 315
Table 125. Alternative effects summary to sensitive plant populations and habitat for the Ochoco Summit OHV Trail System Project Area. 319
Table 126. Noxious Weed Occurrence within the Ochoco Summit Analysis Area. 322
Table 127. Miles of designated trail, and number of gathering areas by alternative. 324
Table 128. Summary of proposed trails and gathering areas within noxious weed infestations. 326
Table 129. Acres of special habitat within the Ochoco Summit project area. 331
Table 130. Acres and miles of proposed trails located within special habitat. 334
Table 131. Number of gathering areas within special habitat. 334
Table 132. Allotment Information. 345
Table 133. Loss of Suitable Rangeland on New Routes (Acres of Forage lost by Alternative). 349
Table 134. Loss of Suitable Rangeland on New Routes for Forage by Alternative & Allotment. 350
Table 135. Range Improvements in the Ochoco Summit Trail System Project Area that are Adjacent to or Intersect Proposed Trail Segments. 352
Table 136. Pollutants and standards. 357
Table 137. Population data in the seven Zone of Influence counties for the Ochoco Summit OHV Trails project. 362
Table 138. Changes in civilian labor force in the Zone of Influence for the Ochoco Summit OHV Trail System project. 362
Table 139. Comparative costs per alternative based on new route length, ground slope and proposed culverts and bridges. 366

List of Figures

Figure 1. Changes in channel morphology and water table elevation associated with entrenchment. 115
Figure 2. Trail Density and Denuded Camping Area in the Mojave Desert. 314
Figure 3. Aspen stands (dark green) on the west end of the Ochoco Summit Project Area in relation to proposed trail locations and gathering areas. 337

CHAPTER 1. PURPOSE OF AND NEED FOR ACTION

Document Structure

The Forest Service has prepared this Environmental Impact Statement in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Impact Statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four chapters:

- *Chapter 1. Purpose and Need for Action:* The chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Chapter 2. Alternatives, including the Proposed Action:* This chapter provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Chapter 3. Affected Environment and Environmental Consequences*: This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area.
- *Chapter 4. Consultation and Coordination:* This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the environmental impact statement.
- *Index:* The index provides page numbers by document topic.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Ochoco National Forest, Prineville, Oregon.

Background

The 2005 Travel Management Rule directs each National Forest to designate roads, trails and areas that are open to motor vehicle use on a motor vehicle use map. Motor vehicle use off designated roads and trails and outside designated areas would then be prohibited by current regulation (36 CFR 261.13). A series of public meetings were held across the Deschutes and Ochoco National Forests between 2006 and 2009 to explain the Travel Management Rule, gather input on the National Forest System (NFS) roads and trails, and discuss changes to the NFS roads and trails. The two-forest-level Travel Management EIS (2011) was informed by that process. The Deschutes and Ochoco Travel Management Record of Decision (2011) designated routes and areas that are available for motorized use. Of the roads that remain open for travel, some are restricted to highway-legal vehicles while others provide opportunities for mixed or shared use by highway-legal and nonhighway-legal motorized vehicles. Generally, cross-country travel is no longer available to off-road motorized vehicles. During the travel management planning process, the Deschutes and Ochoco National Forest supervisors expressed intent to conduct site specific projects to evaluate development of designated

routes and/or areas for Off Highway Vehicle (OHV) use. The Ochoco Summit Trail System project is one site-specific effort; see Map 1 for the project area.

Purpose and Need for Action

Motor vehicles are an appropriate way for people to enjoy the National Forests – in the right places, in the right manner and with proper management. It is Forest Service policy to provide a diversity of road and trail opportunities for experiencing a variety of environments and modes of travel that are consistent with the National Forest recreation role and land capability (Forest Service Manual 2353.03(2)).

As the availability and capability of OHVs have grown, more Americans are enjoying access and recreation opportunities on National Forests and Grasslands. However, a substantial increase in OHV use is exceeding the ability of the Forest Service to manage National Forest System lands for multiple uses. Unmanaged recreation, including impacts from off-highway vehicles, was identified by former Forest Service Chief Dale Bosworth as one of four key threats to sustaining the nation's forests and grasslands. The proliferation of unplanned, unauthorized and non-sustainable roads and trails created by cross-country travel adversely impacts the environment, justifying the need for regulating unmanaged motor vehicle travel. The Travel Management Rule provides policy for ending this trend of unauthorized route proliferation and managing the Forest transportation system in a sustainable manner through designation of motorized National Forest System (NFS) roads, trails, and areas, and the subsequent prohibition of cross country travel by regulation (36 CFR 261.13).

Locally, as well as regionally and nationally, unmanaged OHV use on federal lands has resulted in unplanned roads and trails, soil erosion, watershed and wildlife habitat damage, impacts to cultural sites, safety concerns, trespass and vandalism on adjacent private land and increased conflict between motorized and non-motorized recreational experiences. Perceptions of crowding and user conflict are occurring in some areas of the Forest. Current regulations prohibit trail construction and operation of vehicles in a manner that damages the land, wildlife or vegetation. These regulations have not proven sufficient to control the proliferation of unauthorized routes or environmental damage. According to the OHV IRIS (Internet Research Report Series)[1] report, regional and national OHV use days have increased 42 percent from 2001-2007 (Cordell, 2008). Parallel trends in local OHV use have been noted locally with the population growth of Central Oregon. Increased OHV use and related impacts have been observed by Forest Service personnel as well as by other agencies, non-governmental organizations (NGOs) and the general public. Similar situations have occurred throughout the nation, leading to the Travel Management Rule that governs OHVs and other motor vehicle use on National Forests and Grasslands.

The Deschutes and Ochoco Travel Management EIS identified specific roads as open for motorized mixed use. Motorized mixed use allows concurrent use of a road by highway-legal vehicles (such as a standard passenger vehicle) and nonhighway-legal vehicles (such as off-highway motorcycles or ATVs). Refer to Crimmins (2006)[2] for more detailed descriptions of vehicle types. Designating roads for motorized mixed use involves safety and engineering considerations. This engineering analysis considers factors such as road surface type, roadside conditions (steep side-slopes or large, unyielding features), vehicle speed, traffic volume, and age/licensing (operator experience and understanding of

[1] Off-Highway Vehicle Recreation in the United States and its Regions and States: A National Report from the National Survey on Recreation and the Environment (NSRE) February, 2008 by: H. Ken Cordell, Carter J. Betz, Gary T. Green, and Becky Stephens.

[2] Management Guidelines for OHV Recreation. 2006 by: Tom M. Crimmins in association with the National Off-Highway Vehicle Conservation Council.

the rules of the road). Roads designated for motorized mixed use should limit the risk for all users. The mixed use analysis was conducted as part of the forest-level Travel Management planning process and changes to the mixed use determinations are not included as part of the Proposed Action for this site specific analysis. There is currently only one motorized trail in a forested setting on the Ochoco National Forest, the Green Mountain Trail. At just over eight miles, it is not of sufficient length to provide a day of riding to an experienced rider, let alone a weekend of opportunity. As a result riders are currently venturing off the trail and have created a network of loops. This represents an unauthorized expansion of an undersized trail system. To provide a successful OHV trail system, the system must contain adequate length, diversity, difficulty, loops, alternative routes and other features to provide a quality experience and to keep the use on the designated system.

OHV riders have indicated a desire for additional motorized opportunities other than on mixed use roads. NFS roads are designed primarily for highway-legal vehicles such as passenger cars or log trucks, and are often too wide and too smooth to provide a course with sufficient technical difficulty to keep OHV riders interested and challenged. The intent of providing trails for OHVs is to provide routes with sufficient technical difficulty, diversity of experience and interesting features to keep the riders interested, challenged and engaged with staying on the designated route. The intent of providing mixed use roads is to provide riders with access to a variety of locations on the forest and to provide easy routes for riders who are not looking for a technically difficult experience.

Need for Change

1. There is a need to designate a sustainable system of roads, trails and areas open to motor vehicles that will provide legal public access, enhance regulation of unmanaged wheeled motor vehicle travel, protect resources, and decrease conflicts between motorized and non-motorized use on the Ochoco National Forest.
2. There is a need to change the existing system of NFS motorized-use trails to provide a sufficient number and length of trail in a forested setting to disperse recreational users and make a sustainable network of trails.
3. There is a need to provide a diversity of off-highway motorized recreation opportunities including 4x4 vehicles, ATVs and motorcycles. It is Forest Service policy to provide a diversity of road and trail opportunities for experiencing a variety of environments and modes of travel.

This project will not analyze nor change over-snow motorized travel. It will also not include regulation of non-motorized travel including hiking, skiing, horseback riding or bicycling.

Forest Plan Direction and Other Guidance

The Ochoco National Forest Land and Resource Management Plan (Forest Plan) was approved in 1989, and has since been amended by several decisions. The Forest Plan, as amended, provides guidance for management activities on the Ochoco National Forest. The Forest Plan establishes goals, objectives, and desired future conditions, identifies management areas within the Forest, and provides standards and guidelines for each management area as well as Forest-wide standards and guidelines. In 1995, the Inland Native Fish Strategy (INFISH) Decision Notice amended the Forest Plan. INFISH added goals and objectives for inland native fish habitat condition and function, and identified Riparian Habitat Conservation Areas (RHCAs) where management activities will meet interim standards and guidelines. This proposal is tiered to the Final Environmental Impact Statement (FEIS) for the Forest Plan, as amended.

Forest Plan Management Areas

The major Ochoco National Forest management areas in the project area include (see Map 2):

General Forest (195,735 ac) - The emphasis for this area is to produce timber and forage while meeting the Forest-wide standards and guidelines for all resources (Forest Plan, p. 4-86). Motorized use on designated routes is encouraged (Forest Plan, p. 4-190).

General Forest Winter Range (25,183 ac) - The emphasis for this area is to manage for timber production with management activities designed and implemented to recognize big game habitat needs (Forest Plan, p. 4-84). Motorized use on designated trails and routes is allowed, but such use is restricted to designated open roads between December 1 and May 1 (Forest Plan, p. 4-189).

Winter Range (17,827 ac) – Winter range is to be managed for big game habitat. Road and trail use is to be limited to one mile of open access per section between December 1 and May 1 (Forest Plan, p. 4-83). Motorized use on designated routes is allowed (Forest Plan, p. 4-189).

Lookout Mountain Recreation Area (14,365 ac) - The emphasis for this area is to maintain a natural setting, provide continued opportunities for high quality semiprimitive recreational activities and wildlife habitat, and maintain healthy forests (Forest Plan, p. 4-68). Year-round trails to facilitate the use of the area by horseback riders, mountain bikers, hikers, snowmobilers and cross-country skiers will be developed (Forest Plan, p. 4-188).

Visual Management Corridor (11,478 ac) – The emphasis for this area is to maintain the natural appearing character of the Forest major travel routes, where management activities are usually not evident or are visually subordinate to the surrounding landscape (Forest Plan, p. 4-95).

Old Growth Management Area (7,693 ac) - Habitat will be provided for wildlife species dependent upon old-growth stands with pileated woodpecker as the management indicator species. The desired conditions for these areas are stands of mixed conifer and ponderosa pine with multi-layered canopy with shaded conditions and a large number of snags. Prescribed fire may be evident if natural fuels accumulate to dangerous levels, threatening the existence of the old-growth stand, or where vegetation manipulation is needed to maintain stand structure and species composition (Forest Plan, p. 4-58). No motorized or mechanized use is allowed in Old Growth Management Areas (Forest Plan, p. 4-188 – 4-189).

Summit Trail (5,901 ac) - Acres of the project area that are along the Summit Historic Trail include 221 acres of Partial Visual Retention Corridor and 25 acres of Visual Retention Corridor. The Summit Trail is a historic resource, and was found eligible for nomination to the National Register of Historic Places in January 1987. The emphasis of this management area is to protect the existing integrity of the Summit Trail and enhance and interpret significant segments for public enjoyment and education. Pristine segments of the trail will be managed to protect, interpret and preserve their historic qualities (Forest Plan, p. 4-60-61).

Wilderness (5,355 ac) – Emphasis in Wilderness Areas is to protect the wilderness ecosystems and manage use to maintain a natural setting and preserve solitude (Forest Plan, p. 4-48 – 4-55). No motorized or mechanized use is allowed on trails (Forest Plan, p. 4-188).

Rock/Cottonwood Roadless Area (5,098 ac) - The emphasis for this area is to allow timber harvest while protecting the anadromous fishery, sensitive soils on steep slopes and big game habitat (Forest Plan, p. 4-64).

US Highway 26 Visual Corridor (3,801 ac) - The emphasis for this area is to maintain and enhance scenery for travelers along U.S. Highway 26 (Forest Plan, p. 4-93).

NFCR Scenic Corridor (1,948 ac) - The emphasis for this area is to maintain and enhance the natural appearing landscape and protect the scenic river designation, or where in MA-F6 apply old

growth prescriptions where they are more restrictive (Forest Plan, p. 4-91). This is segment 3 and 4 of the NFCR Wild and Scenic River Plan (1993) with the objective of managing for semiprimitive nonmotorized recreation opportunities (NFCR, p. 10).

Research Natural Area (1,923 ac) - The emphasis for this area is to allow natural processes to occur for research purposes and education; to provide baselines against which other activities may be measured, sites for study of natural processes in undisturbed ecosystems; and gene pool preserves for both plant and animal species (Forest Plan, p. 4-56).

NFCR Recreation Corridor (1,225 ac) - The emphasis for this area is to maintain the appearance of a natural landscape in the foreground view from Forest Road 42 to enhance recreational and scenic values; and to protect and enhance public use and enjoyment of the river segment (Forest Plan, p. 4-89). This is segment 1 of the NFCR Wild and Scenic River Plan (1993) with the objective of riparian improvement, maintaining meadow ecosystems and Roaded Natural recreation opportunities (NFCR, p. 10).

NFCR Recreation Area (1,144 ac) - The emphasis for this area is to maintain the appearance of a natural landscape in the foreground view from Forest Road 42 to enhance recreational and scenic values; and to protect and enhance public use and enjoyment of the river segment (Forest Plan, p. 4-89). This is segment 2 of the NFCR Wild and Scenic River Plan (1993) with the objective of maintaining a Roaded Natural setting using viewpoints and the developed campground (Deep Creek) to inform visitors about the Wild and Scenic River (NFCR, p. 10)

Recreation Trail Visual Retention (1,018 ac) - The emphasis in this area is to protect and manage for scenic qualities that make the trail corridor an attractive recreational setting. Rehabilitate trail sites where management activities conflict with National Recreation Trail objectives. Visitors to this management area will note a natural appearing forest along the majority of the trail route. The outer boundary of the management area will generally not exceed 600 feet on either side of the Round Mountain National Recreation Trail (Forest Plan, p. 4-96).

Deep Creek Recreation Area (901 ac) - The emphasis in this area is to provide a near natural setting for recreational pursuits within the area where management activities are not visually evident (Forest Plan, p. 4-81).

Developed Recreation/Facilities (690 ac) - The emphasis in this area is to provide safe, healthful and aesthetic facilities for people to utilize while they are pursuing a variety of recreational experiences within a relatively natural outdoor setting (Forest Plan, p.4-71).

Eagle Roosting Area (264 ac) - The emphasis in this area is to provide winter roosting habitat for migrating bald eagles annually during the period December through April (Forest Plan, p. 4-70). The annual emphasis period has been changed to November 1 through April 30 based on best available science (Isaacs 2003).

INFISH

The Inland Native Fish Strategy (INFISH) was intended to be interim direction to protect habitat and populations of resident native fish and to provide for options for management. The INFISH delineated RHCAs where riparian-dependent resources receive primary emphasis. These RHCAs include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems. These areas will be managed to maintain or restore water quality, stream channel integrity, channel processes, sediment regimes, instream flows, diversity and productivity of plant communities in riparian zones, and riparian and aquatic habitats to foster unique genetic fish stocks that evolved within the specific region. RHCAs run through and overlay other allocations.

Recreation Management is addressed in INFISH (1995 p. A-9). It states:

RM-1. Design, construct, and operate recreation facilities, including trails and dispersed sites, in a manner that does not retard or prevent attainment of the Riparian Management Objectives and avoids adverse effects on inland native fish. Complete watershed analysis prior to construction of new recreation facilities in Riparian Habitat conservation Areas within priority watershed. For existing recreation facilities inside Riparian Habitat Conservation Areas, assure that the facilities or use of the facilities would not prevent attainment of Riparian Management Objectives or adversely affect inland native fish. Relocate or close recreation facilities where Riparian Management Objectives cannot be met or adverse effects on inland native fish can not be avoided.

RM-2. Adjust dispersed and developed recreation practices that retard or prevent attainment of Riparian Management Objectives or adversely affect inland native fish. Where adjustment measures such as education, use limitations, traffic control devices, increased maintenance, relocation of facilities, and/or specific site closures are not effective in meeting riparian Management Objectives and avoiding adverse effects on inland native fish, eliminate the practice or occupancy.

Implementing INFISH is to achieve a high level of habitat diversity and complexity through a combination of habitat features, to meet the life-history requirements of the fish community inhabiting a watershed. Project proposals are to not retard the attainment of RMOs. To “retard” would mean to slow the rate of recovery below the near natural rate of recovery if no additional human caused disturbance was placed on the system (INFISH 1995 p. A-3).

Proposed Action

The action proposed by the Forest Service to meet the purpose and need is to create a trail network that would include approximately 124 miles of proposed OHV trail and 45 miles of open National Forest System (NFS) roads that connect trail segments or contribute to the network by providing alternate “get-back” routes or other recreational experiences. The trail system would include about 69 miles of trail for Class I vehicles, 48 miles for Class II vehicles, and 52 miles for Class III vehicles. Trail systems for each vehicle class would also include staging areas and trailheads. Staging areas would each have at least one vault toilet, a picnic table, and a kiosk or sign board to provide information and maps. Other amenities, including supervised youth riding areas, defined camp sites, and warm-up loops are proposed at some staging area locations. Picnic tables and/or benches and interpretive signing are proposed at points along some trails. Please refer to Chapter 2, Alternatives Considered in Detail, for a detailed description of the proposed action.

Decision Framework

The Responsible Official for this proposal is the Forest Supervisor of the Ochoco National Forest. The Responsible Official will decide whether to:

- Select the proposed action;
- Select an action alternative that has been considered in detail;
- Modify an action alternative;
- Select the no action alternative;
- Identify what mitigation measures and monitoring will apply.

In making this decision, the Responsible Official will consider how well the alternatives lead to providing a quality motorized recreation experience, minimizing disturbance to big game and big game habitat, minimizing effects to water quality and fish habitat, and managing conflicts between

motorized and nonmotorized recreationists. The Responsible Official will also consider comments submitted by other governments, other agencies, individuals, organizations, and adjacent landowners.

Public Involvement

The Ochoco National Forest maintains working relationships with a broad spectrum of stakeholders including Deschutes Basin Provincial Advisory Committee (PAC), the PAC Travel Management Working Group, Crook County Natural Resources Planning Committee (CCNRPC), non-governmental organizations (NGOs), and other resource management agencies (County, State, Federal and interagency). Between February and November of 2009, the Ochoco National Forest encouraged early involvement by posting information on the web, by making presentations and by interacting with a variety of recreational groups, sportsmen and women, permit holders, adjacent land owners, special interest groups and the general public. Communications on the project also occurred during meetings and field tours with collaborative groups including the PAC and their Travel Management Working Group, and the CCNRPC. Information on this project was also provided at other Central Oregon Travel Management public meetings, and post-cards were sent to the Forest-level Travel Management mailing list encouraging recipients to check the box to be put on the Ochoco Summit project mailing list. Throughout this time, early involvement was encouraged, and many comments were received. These pre-NEPA contacts helped to define areas of concern and options for providing opportunities, which in turn helped shape the strategy that was used during development of the Proposed Action. Some recreation groups have offered to partner in the construction, monitoring and maintenance of proposed trails and facilities, while others have offered to help with rehabilitation and restoration of existing unauthorized routes. We have learned about some issues and concerns, as well as opportunities, and look forward to continuing partnerships and fostering new and diverse alliances as a by-product of this planning effort.

While many individuals and organizations recognize that both motorized and non-motorized recreation are legitimate uses of NFS lands, input received to date fell primarily into two categories. In the first category, comments advocated for off-road (trail) opportunities for motorized use (ATVs, 4x4s and motorcycles). Users are interested in having trails available to them that provide more interesting and challenging experiences than those provided by open roads maintained for standard vehicle types (eg. passenger cars and pick-up trucks). Conversely, others advocated for reducing existing motorized use, with no adoption of any new systems of OHV routes. This category of respondents would prefer to see motorized recreation confined to open roads or existing OHV areas (outside of this planning area). Other respondents believe that both motorized and non-motorized use can be accommodated if strategically planned, well-mapped and signed, maintained and enforced.

Some of the concerns expressed during our discussions with the public were:

- Resource concerns including effects to wildlife, fish, streams, sensitive habitats, forage and weeds.
- Inadequate quality of experience for off-highway vehicle use on open roads; in particular there should be provision of varied motorized use types, loop opportunities, learner opportunities, and difficulty levels of sufficient variety and scale to make a successful network of trails.
- Retention of non-motorized use experience, potential noise levels.
- Retention of traditional motorized recreational experience, noise/traffic levels.
- Concern for increasing off-highway vehicle use on the Forest: shifting from low profile, local and low density use to high profile, destination or high density use.
- User conflicts associated with motorized/non-motorized recreation.
- Economic sustainability of road and trail system.
- Monitoring, maintenance and enforcement of appropriate use.

- Potential economic benefits to communities that rely on recreation-tourism.
- Potential impacts to adjacent land owners.
- Potential impacts to livestock and range improvements on permitted allotments.

The Notice of Intent (NOI) was published in the Federal Register on November 20, 2009. The NOI asked for public comment on the proposal to be submitted on or before December 21, 2009. The Forest Service received 70 comment letters and emails from the public and from other agencies.

Issues

The Forest Service separated the issues into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…". A list of non-significant issues and reasons regarding their categorization as non-significant may be found at the Lookout Mountain Ranger District, Prineville, Oregon, in the record.

As for significant issues, the Forest Service identified the following issues during scoping:

Issue 1: The proposed action trail system is too small and lacks quality (complexity, range of difficulty levels, dispersion of users, etc).

Class I (ATV) users would prefer:

- More miles to disperse users
- More loops, especially near staging areas
- More options, decision points
- Better range of difficulty, especially more difficult
- Separate ATV riding area from 4x4 routes
- Include destinations and viewpoints
- Include north/south connection other than on jeep routes

Class II (jeep and 4x4) users would prefer:

- More trail, less or no open mixed use roads
- Remove all gravel surfaces, bladed roads
- Need array of challenging routes, range from easy to difficult
- Separate jeep trails from ATV routes

Class III (motorcycle) users would prefer:

- More miles for more saddle time and more interesting experience
- Multiple trails from staging areas and/or loops
- Move trails off of open roads
- Move trails off of jeep trail
- Include long loops and destinations

Measures to compare the alternatives include:

Class I opportunities:

- Miles of "new construction" trails (class I)
- Miles of road-to-trail conversion (class I)
- Miles of connecting road necessary to link class I trail segments
- Number of staging areas (class I)
- Number of decision points (trail-to-trail intersections)
- Number of decision points (trail-to-mixed use road intersections)
- Miles of trail within 5 mile radius of center of staging areas
- Number of distinct class I trail loops within 5 mile radius of center of staging areas
- Percent of total class I legal trail miles available that are shared with jeeps.
- Number of selected destinations and viewpoints accessed (Slide Mtn, Pisgah, Peterson Point).

Class II opportunities:

- Miles of "new construction" trails (class II)
- Miles of road to trail conversion (class II)
- Miles of connecting road necessary to link class II trail segments
- Number of decision points (trail-to-trail intersections).
- Number of decision points (trail-to-mixed use road intersections).
- Number of selected destinations and viewpoints accessed (Peterson Lava, Jones Lava, Jones South Lava)

Class III opportunities:

- Miles of "new construction" trails (class III)
- Miles of road-to-trail conversion (class III)
- Miles of connecting road necessary to link class III trail segments
- Number of staging areas (class I and III)
- Miles of trail within 5 mile radius of center of class III staging areas
- Number of distinct class III trail loops within 5 mile radius of center of Class III staging areas
- Miles of ski trail included in class I and III networks
- % of total class III trail miles available that are shared with ATV only
- % of total class III trail miles available that are shared with jeeps and ATV
- Number of decision points (trail-to-trail class III only intersections)
- Number of decision points (trail-to-trail all classes intersections)
- Number of decision points (class III trail-to-mixed use road intersections)

Issue 2: The trail system could impact big game habitat.

- Human/motorized use can disturb or displace big game from preferred habitat or from public to private land.
- Road density and increased motorized route density can impact big game behavior, reproduction and survival.
- The effectiveness of security areas for elk can be reduced or eliminated by human use (especially motorized).

Measures to compare the alternatives include:

- Open road density by Forest Plan management allocation and by 5th field watershed
- Open road plus motorized trail density by Forest Plan allocation and by 5th field watershed
- Acres of elk security habitat by 5th field watershed, as defined by patches > or = 250 acres and > ½ mile from any open road or motorized trail (Hillis)
- Acres of elk security habitat by 5th field watershed, as defined by acres >1/2 mile from open road regardless of patch size (Rowland, Naylor, Preisler, Johnson, Thomas)
- miles of trail > ½ mile from open road and within 2 miles of private land
- Miles of trail > ½ mile from open road and within elk calving areas or RMEF summer range
- Miles of trail within winter range and general forest winter range, or ODFW winter range, or RMEF winter range,/crucial winter range
- Acres by 5th field watershed within ¼ mile of any motorized route (high disturbance zone)
- Acres by 5th field watershed >1 mile from any motorized route (low or no disturbance zone)

Issue 3: The trail system could impact water quality or cause degradation of fish habitat.

- Trail could directly impact fish habitat at and below stream crossings.
- Trail could reduce effectiveness of recent and ongoing restoration efforts (Deep Cr, Crazy Cr, Little Summit Cr, Allen Cr).
- Desire no net degradation of 303(d) listed streams (shade, designated crossings).
- Potential impact to drainage patterns (concentration of flow, change in release rates, sediment mobilization and delivery).
- Potential impacts to streambanks.
- Potential changes to upland soil movement and delivery to riparian areas.
- Potential contamination of surface or ground water (petroleum, bacterial, chemical).

Measures to compare the alternatives include:

- Miles of trail in restoration watersheds (Deep Cr, Allen Cr)
- Miles of trail in anadromous watersheds (Rock Cr)
- Number total trail-over-stream crossings by stream class by 6th field W
- Number of new construction trail-over-stream crossings, on 303d within each 6th field W
- Number of total trail-over-stream crossings on 303d, by stream class within each 6th field W
- miles of new construction trails by 6th field watershed, sum by 5th field
- miles of road-to-trail conversion by 6th field watershed, sum by 5th field
- RER: miles of trail plus open roads by stream class I, II and III within three adjacency bands: 0- 200’; 201-400’; 401-600’.
- Hydraulic net: density of open and closed roads plus trails by 5th field
- Miles of trail on unstable slope based on slope/erosion hazard map
- Number of staging areas by vehicle type as related to potential contamination of surface or ground water (petroleum, bacterial, chemical).

Issue 4: The trail system could create or exacerbate conflict between motorized and non-motorized recreationists.

- Noise impacts vs. "natural quiet" experience
- Impacts to Recreation Opportunity Spectrum (ROS):
  - Semiprimitive nonmotorized (RNA, Old Growth)
  - Semiprimitive nonmotorized, snowmobiles allowed Dec 1-May 1 (Rock Crk/Cottonwood Crk, North Fork Crooked River Scenic Corridor)
  - Roaded Natural (Deep Creek Rec. Area, Summit National Historic Trail, riparian, Bandit Springs, North Fork Crooked River Rec. Corridor)
  - Roaded Natural, Roaded Modified or Rural (visual management corridors)
- Impacts to Wilderness Recreation Spectrum
  - Primitive and semiprimitive nonmotorized (Wilderness, Wilderness Study Area)
- Impacts to developed recreation sites
- Impacts to dispersed recreation camp sites
- Opportunity to achieve and balance S&Gs on LRMP pg 4-183, 4-189 and 4-190
- Impact of trails on angler and hunter satisfaction and success
- Impact of trails on non-consumptive recreational use (bird watching, wild flower viewing, wildlife photography, sight-seeing, etc)
- Impact to non-motorized trails (hiking, horseback, mtn biking, Nordic skiing)

Measures to compare the alternatives include:

- Estimated user days
- Acres of potential noise disturbance by trail type based on decibel levels and average distance heard
- Change in acres of noise disturbance zone compared to open road baseline
- Acres of Semiprimitive Non-motorized ROS (RNA, Old Growth, Rock Crk/Cottonwood Crk, North Fork Crooked River Scenic Corridor) from which sounds of OHVs might be audible at > 45 db.
- Acres of Roaded Natural ROS (Deep Creek Recreation Area, Summit National Historic Trail, RiparianArea, Bandit Springs Recreation Area, North Fork Crooked River Recreation Corridor, Round Mountain National Recreation Trail) from which sounds of OHVs might be audible at > 45 db.
- Acres of Roaded Natural, Roaded Modified or Rural (Eagle Roosting Areas, Developed Recreation, Dispersed Recreation, Winter Range, General Forest Winter Range, General Forest, Highway 26 Visual Corridor, Visual Management Corridors, Facilities) from which sounds of OHVs might be audible at > 45 db.)
- Acres of Wilderness Recreation Spectrum, Primitive and Semiprimitive (Bridge Creek Wilderness, North Fork Crooked River Wilderness Study Area) from which sounds of OHVs might be audible at > 45 db.
- Number of developed recreation sites (campgrounds, cabins, etc) from which sounds of OHVs might be audible at > 45 db.
- Number of dispersed sites (dispersed recreation camp sites in LRMP) from which sounds of OHVs might be audible at > 45 db.
- Miles of dispersed camping roads (MVUM) from which sounds of OHVs might be audible at > 45 db.
- Miles of non-motorized trails, trailhead or trail shelters (LRMP) from which sounds of OHVs might be audible at > 45 db.
- Miles of non-motorized non-system horse trails, endurance ride staging areas and horse trail group camp sites from which sounds of OHVs might be audible at > 45 db.

CHAPTER 2. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Introduction

This chapter describes and compares the alternatives considered for the Ochoco Summit Trail System. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative and some of the information is based upon the environmental, social and economic effects of implementing each alternative.

Alternatives Considered in Detail

The Forest Service developed 4 alternatives, including the No Action and Proposed Action alternatives, in response to issues raised by the public.

Alternative 1 (No Action)

Alternative 1 is the No Action Alternative is included as a baseline comparison of continuing the existing conditions without implementing the proposed actions as required by the CEQ Regulations (40 CFR 1502.14). Alternative 1 would not implement any changes in the current management direction regarding motorized access. Enforcement of existing restrictions found in the Ochoco National Forest Plan and site-specific decisions would continue. This includes past decisions to close or decommission National Forest system roads that may not have been implemented through physical barriers or signing, or where the closure method was limited to not conducting routine maintenance activities. The current management direction for travel would be directed by the management plan that is in place. A decision has been made on the forest-level Travel Management Plan (which implements the 2005 Travel Management Rule). The direction included in that decision is the current management direction.

Alternative 2 (Proposed Action)

Alternative 2 focuses on designating motorized trails and supporting areas, in conjunction with opportunities that would remain on mixed use roads identified in the forest-level Travel Management EIS. Table 1 provides a summary of actions proposed in Alternative 2.

The Proposed Action would:

- Designate a system of trails and areas (including staging areas, play areas, riding areas where young riders may be supervised by adults, learner/warm-up loops, picnic and camping areas) by class of vehicle and season of use.
- Utilize designated open motorized mixed use roads as connecters between trail segments.
- Designate areas for developed and dispersed camping activities with legal trail access.
- Implement rehabilitation or restoration activities in previously damaged areas and interconnecting unauthorized or user-created routes to promote recovery, and to prevent confusion about which routes are open and which are not.

- Establish directional, informational and interpretive signing to: facilitate proper trail use, safety and enforcement; to provide public information and education; to define trail, riding area, staging area and camp sites locations; to promote recovery of rehabilitation and restoration sites; and to encourage reporting of violations, restoration or maintenance needs.
- Motorized trails would be open for use by specified vehicle type, seasonally between May 1 and November 1 of each year, except on Paulina Ranger District, where trails would close at the beginning of the restriction period specified for the Rager Cooperative Travel Management Area, and would remain closed until May 1 of each year.
- Non-motorized use would not be prohibited on proposed motorized trails.
- Camping would be allowed at staging areas within designated camp sites, as well as in dispersed camp sites at trailheads or as allowed in the current Travel Management Plan.

Maps 3 and 4 show the network of proposed roads, trails and areas included in the proposed action, the project area boundary and a background of existing open roads. The Proposed Action maps show where the proposed routes and supporting areas are located and how the routes overlay existing soil disturbance as identified by the presence of existing NFS roads. Refer to the legend for route color codes: existing disturbance is shown by the two colors used to display roads (orange, green). The Proposed Action maps also display quality of user experience as determined by whether the proposed route provides potential for trail features (narrow, winding, challenging) or whether it falls on an open road (easy travel, easy access, mixed traffic). Refer to the legend for route color codes: road-to-trail conversions are proposed on closed/decommissioned roads (green), while new trail construction is proposed on route segments that are not on NFS roads (blue). Routes on open mixed use roads are shown in orange.

Trails would be designed with width and difficulty appropriate for each intended vehicle type, while roads designated as open in the forest-level Travel Management EIS would not be narrowed to trail standards (ie. designated open roads would remain designated open roads). Trail widths would be based on intended vehicle types, which are also displayed on Maps 3 and 4. Refer to the legend for vehicle types I, II and III. Motorcycle-only trails (single track) would be designed for 24” wide clearance and are displayed on the maps as a dashed line. Only single track vehicles would be allowed on single track trails (ie. no ATVs or 4x4s). All-terrain vehicle (ATV) trails would be designed for 50” wide clearance and are displayed as a dotted line on the maps. ATV trails would be available for use by ATVs and motorcycles but not 4x4s or side-by-side buggies. Class II trails would be designed for 80” wide clearance and are displayed on the maps as a line with cross bars. Class II trails would be available for use by any vehicle with an outside maximum width of less than 80” (jeeps, ¼ ton trucks and SUVs, side-by-side buggies, rock crawlers, etc.)

This project does not propose to change roads that would be open or closed to motorized access under the forest-level Travel Management EIS. The routes shown on these maps include proposed trails as well as about 45 miles of interconnected roads that are designated for mixed use by highway legal and non-highway legal vehicles (OHVs and passenger cars/trucks). The open roads are not changed from the forest-level EIS, but are shown on the Proposed Action map as they serve as connectors between trail segments, or they enhance loop opportunities/options for trail users.

***The Proposed Action trail network includes*:**

Overall, the OHV network displayed on the Proposed Action map includes approximately 124 miles of proposed OHV trail and 45 miles of open National Forest System (NFS) roads that connect trail segments or contribute to the network by providing alternate “get-back” routes or other recreational experiences (also see Table 1).

Of the total 69 miles in the Class I vehicle (ATV) network, 14 miles are on open roads, 25 miles are on closed or decommissioned road beds and 30 miles are not on NFS roads. This would allow for up to 55 miles of 50" wide trail through conversion of old road beds and new trail construction combined. In addition all Class II trails would be available for use by ATVs. Mixed use roads identified under the forest-wide Travel Management EIS would also remain available for use by ATVs.

Of the total 48 miles in the Class II vehicle (jeep, small truck and buggy) network, 28 miles are on open roads, 8 miles are on closed or decommissioned road beds and 12 miles are not on NFS roads. This would allow for up to 20 miles of 80" wide trail through conversion of old road beds and new trail construction combined. Mixed use roads identified under the forest-wide Travel Management EIS would remain available for use by non-highway-legal jeeps and buggies and highway-legal vehicles would have access to all roads identified as open in the forest-wide EIS.

Of the total 52 miles of Class III vehicle (motorcycle) network, 4 miles are on open roads, 23 miles are on closed or decommissioned road beds and 26 miles are not on NFS roads. This would allow for up to 49 miles of 24" wide trail through conversion of old road beds and new trail construction combined. In addition all Class I and II trails would be available for use by motorcycles. Mixed use roads identified under the forest-wide Travel Management EIS would remain available for use by non-highway-legal motorcycles and highway-legal vehicles would have access to all roads identified as open in the forest-wide EIS.

***The Proposed Action motorized use areas include*:**

In support of the proposed Class I network, four staging areas and two trailheads are proposed along the west half of the ATV route (west of the class II network), while two staging areas and one trailhead are proposed along the east half of the ATV route (east of the class II network). Proposed staging area locations include: Ochoco Divide Snow Park, Ahalt Mineral Source, Walton Snow Park, Scott's Mineral Source, Aspen Mineral Source and Road 600. Proposed trailhead access points include: Road 350 south of Indian Butte, road 550 at Allen Creek and Road 500 north of Jones Lava. Class I staging areas and trailheads would also be available for use by motorcycles (Class I and III).

In support of the proposed Class II network, two staging areas and three trailheads are proposed along the designated route. Class II staging areas and trailheads are distributed in order to provide access to a variety of terrain features and camp sites. Staging area locations include: Peterson Lava and Ross/Peterson ridge. Proposed trailhead access points include: East Porter Creek, Looney/Porter lava and Scott's Camp Mineral Source. Class II staging areas would also be available for use by ATVs and motorcycles (Class I, II and III).

In support of the proposed Class III network, two staging areas are proposed along the motorcycle-only route. Staging area locations include: Cottonwood Pit Mineral Source and Six Corners Mineral Source. Trails out of these staging areas would only be available for use by motorcycles (Class III only).

***Amenities*:**

Under the Proposed Action staging areas would provide amenities to support the intended use for each specific area. All staging areas would include at least one vault toilet, a picnic table and a kiosk or sign board with informational/directional signs and maps. Site specific amenities for each staging area are as follows:

- Ochoco Divide Snow Park would retain existing level of facilities (paved parking area, one vault toilet and a sign board). The objective for this staging area would be to provide access for trail users who travel/camp in recreational vehicles that are generally self-contained and require little additional amenities. This staging area would include a simple warm-up or

learner loop, and would generally be an entry point for visitors planning to travel eastward on the trail.

- Ahalt Mineral Source would be improved to support ATV and motorcycle staging. The objective for this area would be to provide for use by trail riders with a range of experience levels, for day or overnight use, for play area and/or for trail access. Amenities that would be needed include at least two vault toilets, defined and hardened camp sites, play area boundary markers, supervised youth rider area (markers or fence), picnic tables and sign boards.
- Walton Snow Park would be improved to support ATV and motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. Amenities that would be added include one more vault toilet, picnic tables and sign boards (near the existing toilet) and directional signing to keep users headed north from the staging area.
- Scott's Mineral Source would be improved to support ATV and motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a simple warm-up or learner loop, but would generally be intended to be an entry point for visitors planning to travel the east/west trail corridor. Amenities that would be added include at least one vault toilet, defined camp sites, picnic tables, sign boards and directional signing to lead riders onto the trail out of the staging area.
- Aspen Mineral Source would be improved to support ATV and motorcycle staging. The objective for this area would be to provide for use by trail riders with a range of experience levels, for day or overnight use, for play area and/or for trail access. Amenities that would be needed include at least one vault toilet, defined camp sites, play area boundary and hazard markers, supervised youth rider area (markers or fence), picnic tables and sign boards.
- Road 600 Staging Area would be improved to support ATV and motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a simple warm-up or learner loop, but would generally be intended to be an entry point for visitors planning to travel north. Amenities that would be added include at least one vault toilet, defined camp sites, picnic tables, sign boards and directional signing to lead riders onto the trail out of the staging area.
- Peterson Lava would be improved to support class II vehicle (jeep, etc) staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a short rock crawl loop (easy to moderate), but would generally be intended to be an entry point for visitors planning to travel throughout the class II area, or south on the jeep trail. Amenities that would be added include at least one vault toilet, defined camp sites, picnic tables, sign boards, haz-mat supply, and directional signing.
- Ross/Peterson ridge would be improved to support class II staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would provide an entry point for visitors planning to travel throughout the class II area, or quick access to the south end of the jeep trail. Amenities that would be added include a hardened parking area, at least one vault toilet, defined camp sites, picnic tables, sign boards, haz-mat supply, and directional signing.
- Cottonwood Pit Mineral Source would retain existing level of facilities but would serve as a motorcycle staging area. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a warm-up or learner loop and supervised youth riding area, but would generally be intended to be an entry point for visitors planning to travel east or west on the single-track trail loop. Amenities that would be added

include a hardened parking area, picnic tables and sign boards (near the existing toilet) and directional signing to lead users to the trails out of the staging area.

- Six Corners Mineral Source would be improved to support motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a warm-up or learner loop and a supervised youth riding area, but would generally be intended to be an entry point for visitors planning to travel the single-track trail loop. Amenities that would be added include at least one vault toilet, defined camp sites, picnic tables, supervised youth rider area markers or fence, sign boards and directional signing to lead riders onto the trail out of the staging area.

Throughout the area, trailheads would remain as dispersed camp sites without developed recreation amenities such as toilets and picnic tables. Trailhead markers with informational signboards would be installed at mapped trailhead locations. At these locations hardening of surfaces for camp sites, turn-arounds and parking areas, and defining of campsites, would occur as needed. Other dispersed camp sites do occur along the trail that will not be mapped, these camp sites will generally not be modified, but trail routes passing by these sites would have directional signs and entrance filters (entrance devices to control vehicle size) installed, and camp sites defined as needed.

Selected locations along proposed trails would be improved to provide opportunities for sight- seeing, interpretive signing, rest/regroup areas and trail-side picnics. These locations would be at scenic viewpoints, points of interest, shady spots, etc. Improvements would be limited to picnic tables and/or benches and interpretive signing.

Table 1. Summary of proposed motorized trails and areas, Alternative 2, Ochoco Summit Trail System project.

Trail Type	Proposed Action – trail miles	Staging Areas	Mapped Trail Heads
Motorcycle (<24”) Trail	49	2	0
ATV (vehicles <50”) Trail	55	6	3
4x4 (vehicles <80”) Trail	20	2	3
Total	**124**	**10**	**6**

Non-Significant Amendments to Forest Plan

Alternative 2 includes three site-specific amendments to the Ochoco Land and Resource Management Plan. Each of these is related to designation of motorized crossings in Old Growth Management Areas (MA-F6) allocated in the 1989 LRMP other than on constant service roads (4-232, 4-234):

1. Old Growth Management Area (OG-D1-08) at Indian Butte to include motorized recreation only on designated routes including one new crossing to connect between roads 2200-306 and 2200-309.
2. Old Growth Management Area (OG-D1-12) at East Porter to include motorized recreation only on designated routes including one new crossing at Looney Creek to connect between roads 4200-430 and 4200-440.
3. Old Growth Management Area (OG-D2-1) near Chamberlin Spring to include motorized recreation only on designated routes including one crossing on closed road 4250-700 to connect between roads 4250-610 and 1200-440.
4. Old Growth Management Area (OG-D2-02) near Deep Creek to include motorized recreation only on designated routes including one new crossing.

Alternative 3

Alternative 3 was developed in response to Key Issues 2, 3 and 4, and is intended to provide motorized trails and areas at a lesser scale to reduce potential for impacts to water quality, fish and wildlife, and to reduce conflict between motorized and non-motorized recreational use. Table 2 provides a summary of actions proposed under Alternative 3.

Alternative 3 would:

Alternative 3 offers many of the features described for Alternative 2 with the following exceptions:

- Motorized trails would be open for use by specified vehicle type, seasonally between June 1 and September 30 of each year, except on Paulina Ranger District, where trails would close at the earlier date of September 30 or the beginning of the restriction period specified for the Rager Cooperative Travel Management Area, and would remain closed until June 1 of each year.
- The motorcycle (Class III) loop trail does not include the side loop in the Derr and upper Jackson Creek area that was in the Proposed Action. It also does not include the staging area or associated trails at Forest Road 4200-600, or the staging and play areas and associated trails at and around Aspen Pit compared to Alternative 2. It also does not include the staging area at Peterson Lava or any of the trailheads from Alternative 2.
- Compared to the Alternative 2: the class I staging and parking areas at Ahalt Pit are not included; the singular (there-and-back) ATV (class II) route between Indian Butte (at Forest Road 2200-350) and Scott's camp is not included; and none of the trailheads are included in this alternative.
- Alternative 3 does not include designated trails or staging areas for class II vehicles (jeeps and buggies).

Maps 5 and 6 show the network of proposed roads, trails and areas included in Alternative 3, the project area boundary and a background of existing open roads. The alternative maps show where the proposed routes and supporting areas are located and how the routes overlay existing soil disturbance as identified by the presence of existing NFS roads. Refer to the legend for route color codes: existing disturbance is shown by the two colors used to display roads (orange, green). The alternative maps also display quality of user experience as determined by whether the proposed route provides potential for trail features (narrow, winding, challenging) or whether it falls on an open road (easy travel, easy access, mixed traffic). Refer to the legend for route color codes: road-to-trail conversions are proposed on closed/decommissioned roads (green), while new trail construction is proposed on route segments that are not on NFS roads (blue). Routes on open mixed use roads are shown in orange.

Trails would be designed with width and difficulty appropriate for each intended vehicle type, while roads designated as open in the forest-level Travel Management EIS would not be narrowed to trail standards (i.e. designated open roads would remain designated open roads). Trail widths would be based on intended vehicle types, which are also displayed on Maps 5 and 6. Refer to the legend for vehicle types I and III. Motorcycle-only trails (single track) would be designed for 24" wide clearance and are displayed on the maps as a dashed line. Only single track vehicles would be allowed on single track trails (ie. no ATVs or 4x4s). All-terrain vehicle (ATV) trails would be designed for 50" wide clearance and are displayed as a dotted line on the maps. ATV trails would be available for use by ATVs and motorcycles but not 4x4s or side-by-side buggies. Alternative 3 does not include designated trails for class II vehicles (jeeps and buggies).

This project does not propose to change roads that would be open or closed to motorized access under the forest-level Travel Management EIS. The routes shown on these maps include proposed trails (approximately 88 miles) as well as about 13 miles of interconnected roads that are designated for mixed use by highway legal and non-highway legal vehicles (OHVs and passenger cars/trucks). The open roads are not changed from the forest-level EIS, but are shown on the Alternative 3 map as they serve as connectors between trail segments, or they enhance loop opportunities/options for trail users.

***Alternative 3 trail network includes*:**

In contrast to Alternative 2, this alternative includes two discrete riding areas for class I and III (ATVs and motorcycles) that are separated by an area without designated trails:

- A single track (class III) loop between Peterson Lava and Six Corners that incorporates some of the proposed jeep trail route locations from the Proposed Action alternative. This alternative does include one of the central tie-through trails between Paulina Butte and Jackson Creek. This alternative does retain staging areas at both Cottonwood Pit and Six Corners Mineral Source and their associated amenities.
- A series of interconnected 50” trails (class I and III) and loops between Ochoco Divide Snow Park, Walton Snow Park and road 2200-350 are included. Additional loops on the west end are included compared to the Proposed Action in order to provide adequate trail miles within a more compact area, multiple decision points and alternate loop options. Staging areas at Ochoco Divide Snow Park and Walton Snow Park are included in this alternative.

***The Alternative3 motorized use areas include*:**

In support of the proposed Class I network, two staging areas are proposed along the ATV route (in the west end of the analysis area). Proposed staging area locations include: Ochoco Divide Snow Park and Walton Snow Park. Class I staging areas would also be available for use by motorcycles (Class III).

In support of the proposed Class III network, two staging areas are proposed along the motorcycle-only route. Staging area locations include: Cottonwood Pit Mineral Source and Six Corners Mineral Source. Trails out of these staging areas would only be available for use by motorcycles (Class III only).

***Amenities*:**

Under Alternative 3 staging areas would provide amenities to support the intended use for each specific area. All staging areas would include at least one vault toilet, a picnic table and a kiosk or sign board with informational/directional signs and maps. Site specific amenities for each staging area are as follows:

- Ochoco Divide Snow Park would retain existing level of facilities (paved parking area, one vault toilet and a sign board). The objective for this staging area would be to provide access for trail users who travel/camp in recreational vehicles that are generally self-contained and require little additional amenities. This staging area would include a simple warm-up or learner loop, and would generally be an entry point for visitors planning to travel eastward on the trail.
- Walton Snow Park would be improved to support ATV and motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. Amenities that would be added include one more vault toilet, picnic tables and sign boards (near the existing toilet) and directional signing to keep users headed north from the staging area.

- Cottonwood Pit Mineral Source would retain existing level of facilities but would serve as a motorcycle staging area. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a warm-up or learner loop and supervised youth riding area, but would generally be intended to be an entry point for visitors planning to travel east or west on the single-track trail loop. Amenities that would be added include a hardened parking area, picnic tables and sign boards (near the existing toilet) and directional signing to lead users to the trails out of the staging area.
- Six Corners Mineral Source would be improved to support motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a warm-up or learner loop and a supervised youth riding area, but would generally be intended to be an entry point for visitors planning to travel the single-track trail loop. Amenities that would be added include at least one vault toilet, defined camp sites, picnic tables, supervised youth rider area markers or fence, sign boards and directional signing to lead riders onto the trail out of the staging area.

Dispersed camp sites do occur along the trail that will not be mapped, these camp sites will generally not be modified, but trail routes passing by these sites would have directional signs and entrance filters (entrance devices to control vehicle size) installed, and camp sites defined as needed. Camping would be allowed as in dispersed camp sites as allowed in the current Travel Management Plan. Selected locations along proposed trails would be improved to provide opportunities for sight- seeing, interpretive signing, rest/regroup areas and trail-side picnics. These locations would be at scenic viewpoints, points of interest, shady spots, etc. Improvements would be limited to picnic tables and/or benches and interpretive signing.

Table 2. Summary of proposed Ochoco Summit Trail System, Alternative 3, motorized trails and areas.

Trail Type	Proposed Action – trail miles	Staging Areas	Mapped Trail Heads
Motorcycle (<24”) Trail	53	2	0
ATV (vehicles <50”) Trail	35	2	0
4x4 (vehicles <80”) Trail	0	0	0
Total	**88**	**4**	**0**

Non-Significant Amendments to Forest Plan

Alternative 3 includes two site-specific amendments to the Ochoco Land and Resource Management Plan. Each of these is related to designation of motorized crossings in Old Growth Management Areas (MA-F6) allocated in the 1989 LRMP other than on constant service roads (4-232, 4-234):

1. Old Growth Management Area (OG-D1-08) at Indian Butte to include motorized recreation only on designated routes including one new crossing to connect between roads 2200-306 and 2200-309.
2. Old Growth Management Area (OG-D1-12) at East Porter to include motorized recreation only on designated routes including one new crossing at Looney Creek to connect between roads 4200-430 and 4200-440.
3. Old Growth Management Area (OG-D2-02) near Deep Creek to include motorized recreation only on designated routes including one new crossing.

Alternative 4

Alternative 4 was developed in response to Issue 1; it includes trails for class I, II and III vehicles over more area and with more miles than the Proposed Action. The associated staging areas, trailheads and play areas are similar to the Proposed Action, except: 1) moving ATV staging areas from Scott's Mineral Source to Allen Creek and moving Aspen Pit Staging Area to the ridge east of Happy Camp Creek; 2) dropping of ATV trailheads on rds 2200-350 and 550, 3) dropping of two trailheads at Porter Creek. We anticipate a larger number of trail miles for all three vehicle types, and a higher percentage of class II trails not on roads compared to Proposed Action, but likely less total miles for class II due to exclusion of open roads from the class II network. Table 4 provides a summary of actions proposed under Alternative 4.

Alternative 4 would:

Alternative 4 offers the same features described for Alternative 2, but over a slightly larger area, with more trail miles and fewer supporting facilities such as trailheads.

Maps 7 and 8 show the network of proposed roads, trails and areas included in Alternative 4, the project area boundary and a background of existing open roads. The Alternative 4 maps show where the proposed routes and supporting areas are located and how the routes overlay existing soil disturbance as identified by the presence of existing NFS roads. Refer to the legend for route color codes: existing disturbance is shown by the two colors used to display roads (orange, green). The Alternative maps also display quality of user experience as determined by whether the proposed route provides potential for trail features (narrow, winding, challenging) or whether it falls on an open road (easy travel, easy access, mixed traffic). Refer to the legend for route color codes: road-to-trail conversions are proposed on closed/decommissioned roads (green), while new trail construction is proposed on route segments that are not on NFS roads (blue). Routes on open mixed use roads are shown in orange.

Trails would be designed with width and difficulty appropriate for each intended vehicle type, while roads designated as open in the forest-level Travel Management EIS would not be narrowed to trail standards (i.e. designated open roads would remain designated open roads). Trail widths would be based on intended vehicle types, which are also displayed on Maps 7 and 8. Refer to the legend for vehicle types I, II and III. Motorcycle-only trails (single track) would be designed for 24" wide clearance and are displayed on the maps as a dashed line. Only single track vehicles would be allowed on single track trails (i.e. no ATVs or 4x4s). ATV trails would be designed for 50" wide clearance and are displayed as a dotted line on the maps. ATV trails would be available for use by ATVs and motorcycles but not 4x4s or side-by-side buggies. Class II trails would be designed for 80" wide clearance and are displayed on the maps as a line with cross bars. Class II trails would be available for use by any vehicle with an outside maximum width of less than 80" (jeeps, ¼ ton trucks and SUVs, side-by-side buggies, rock crawlers, etc.).

This project does not propose to change roads that would be open or closed to motorized access under the forest-level Travel Management EIS. The routes shown on these maps include proposed trails (approximately 158 miles) as well as about 53 miles of interconnected roads that are designated for mixed use by highway legal and non-highway legal vehicles (OHVs and passenger cars/trucks). The open roads are not changed from the forest-level EIS, but are shown on the Proposed Action map as they serve as connectors between trail segments, or they enhance loop opportunities/options for trail users.

***The Alternative 4 trail network includes*:**

Similar to the Proposed Action this alternative features several interconnected trail systems:

- Class I network includes a series of shorter interconnecting loops, offering numerous decision points, on the west end. This portion of the ATV network would be served by 4 staging areas (Ochoco Divide, Ahalt, Walton and Allen Creek). In the east central part of the project area there would be a moderate size loop generally east of the Jeep area and west of the motorcycle loops, served by two staging areas (Happy Camp/Double Corral ridge, and 4200-600 mineral source. This central loop could be ridden entirely without entering the jeep area, but ATV and motorcycle riders could choose to use the jeep trails being provided three legal points of access.
- Class II network would include a series of 80" trails created by a combination of new construction and road-to-trail conversion, served by two staging areas and one trailhead. These trail segments would be connected with the minimal amount of open mixed use road necessary to get from one staging area to the other, and to connect from one discrete trail segment to the next. Though other alternate loop options would remain available on mixed use roads, these extra opportunities would not be included in the system of designated routes and would not be managed as designated routes. Camp areas would be within 300' of open roads and would not have exclusive use by class II vehicles. All 80" trails would be available to any rubber tired vehicle with a maximum width of 80", though some routes would be posted as not recommended for certain vehicle types.
- Class III network would include a series of interconnected loops ranging from short to long, offering numerous decision points. The motorcycle only network would be served by two staging areas (Six Corners and Cottonwood Pit). The motorcycle only network would interconnects with the central ATV system, providing more options for class III riders without having to enter the jeep area. Class III vehicles could use the entire system of trails if they choose to do so, however they could also travel from the west end to the east end without having to travel on a class II trail. However, to do so they would have to make connections between the west end network and the central /eastern networks on mixed used road 2630 and 2630-750 or 2630-800.

***The Alternative 4 motorized use areas include*:**

In support of the proposed Class I network, four staging areas are proposed along the west half of the ATV route (west of the class II network), while two staging areas are proposed along the east half of the ATV route (east of the class II network). Proposed staging area locations include: Ochoco Divide Snow Park, Ahalt Mineral Source, Walton Snow Park, Scott's Mineral Source, Aspen Mineral Source and Road 600. Class I staging areas would also be available for use by motorcycles (Class I and III).

In support of the proposed Class II network, two staging areas are proposed along the designated route. Class II staging areas are distributed in order to provide access to a variety of terrain features and camp sites. Staging area locations include: Peterson Lava and Ross/Peterson ridge. Class II staging areas would also be available for use by ATVs and motorcycles (Class I, II and III).

In support of the proposed Class III network, two staging areas are proposed along the motorcycle-only route. Staging area locations include: Cottonwood Pit Mineral Source and Six Corners Mineral Source. Trails out of these staging areas would only be available for use by motorcycles (Class III only).

***Amenities*:**

Under the Proposed Action staging areas would provide amenities to support the intended use for each specific area. All staging areas would include at least one vault toilet, a picnic table and a kiosk

or sign board with informational/directional signs and maps. Site specific amenities for each staging area are as follows:

- Ochoco Divide Snow Park would retain existing level of facilities (paved parking area, one vault toilet and a sign board). The objective for this staging area would be to provide access for trail users who travel/camp in recreational vehicles that are generally self-contained and require little additional amenities. This staging area would include a simple warm-up or learner loop, and would generally be an entry point for visitors planning to travel eastward on the trail. Amenities that would be needed include sign boards and directional signing.
- Ahalt Mineral Source would be improved to support ATV and motorcycle staging. The objective for this area would be to provide for use by trail riders with a range of experience levels, for day or overnight use, for play area and/or for trail access. Amenities that would be needed include at least two vault toilets, defined and hardened camp sites, play area boundary markers, riding area where youth could be supervised (markers or fence), picnic tables, sign boards and directional signing.
- Walton Snow Park would be improved to support ATV and motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. Amenities that would be added include one more vault toilet, picnic tables and sign boards (near the existing toilet) and directional signing to keep users headed north from the staging area.
- Scott's Mineral Source would be improved to support ATV and motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a simple warm-up or learner loop, but would generally be intended to be an entry point for visitors planning to travel the east/west trail corridor. Amenities that would be added include at least one vault toilet, defined camp sites, picnic tables, sign boards and directional signing to lead riders onto the trail out of the staging area.
- A staging area approximately 1 mile east of Aspen Mineral Source (near FS Road 30/850) would be improved to support ATV and motorcycle staging. The objective for this area would be to provide for use by trail riders with a range of experience levels, for day or overnight use, for trail access. Amenities that would be needed include at least one vault toilet, defined camp sites, a simple warm-up or learner loop, picnic tables, sign boards and directional signing.
- Road 600 Staging Area would be improved to support ATV and motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a simple warm-up or learner loop, but would generally be intended to be an entry point for visitors planning to travel north. Amenities that would be added include at least one vault toilet, defined camp sites, picnic tables, sign boards and directional signing to lead riders onto the trail out of the staging area.
- Peterson Lava would be improved to support class II vehicle (jeep, etc) staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a short rock crawl loop (easy to moderate), but would generally be intended to be an entry point for visitors planning to travel throughout the class II area, or south on the jeep trail. Amenities that would be added include at least one vault toilet, defined camp sites, picnic tables, sign boards, haz-mat supply, and directional signing.
- Ross/Peterson ridge would be improved to support class II staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would provide an entry point for visitors planning to travel throughout the class II area, or quick

access to the south end of the jeep trail. Amenities that would be added include a hardened parking area, at least one vault toilet, defined camp sites, picnic tables, sign boards, haz-mat supply, and directional signing.

- Cottonwood Pit Mineral Source would retain existing level of facilities but would serve as a motorcycle staging area. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a warm-up or learner loop and riding area where youth could be supervised, but would generally be intended to be an entry point for visitors planning to travel east or west on the single-track trail loop. Amenities that would be added include a hardened parking area, picnic tables and sign boards (near the existing toilet) and directional signing to lead users to the trails out of the staging area.
- Six Corners Mineral Source would be improved to support motorcycle staging. The objective for this area would be to provide a trail access point for day or overnight use. This staging area would include a warm-up or learner loop and a riding area where youth could be supervised, but would generally be intended to be an entry point for visitors planning to travel the single-track trail loop. Amenities that would be added include at least one vault toilet, defined camp sites, picnic tables, supervised youth rider area markers or fence, sign boards and directional signing to lead riders onto the trail out of the staging area.

Dispersed camp sites that occur along the trail will not be mapped; these camp sites generally will not be modified, but trail routes passing by these sites would have directional signs and entrance filters (entrance devices to control vehicle size) installed, and camp sites defined as needed. Camping would be allowed as in dispersed camp sites as allowed in the current Travel Management Plan. Selected locations along proposed trails would be improved to provide opportunities for sight- seeing, interpretive signing, rest/regroup areas and trail-side picnics. These locations would be at scenic viewpoints, points of interest, shady spots, etc. Improvements would be limited to picnic tables and/or benches and interpretive signing.

Table 3. Summary of proposed Ochoco Summit Trail System, Alternative 4, motorized trails and areas.

Trail Type	Proposed Action – trail miles	Staging Areas	Mapped Trail Heads
Motorcycle (<24”) Trail	45	2	0
ATV (vehicles <50”) Trail	95	6	0
4x4 (vehicles <80”) Trail	18	2	0
Total	**158**	**10**	**0**

Non-Significant Amendments to Forest Plan

Alternative 4 includes three site-specific amendments to the Ochoco Land and Resource Management Plan. Each of these is related to designation of motorized crossings in Old Growth Management Areas (MA-F6) allocated in the 1989 LRMP other than on constant service roads (4-232, 4-234):

1. Old Growth Management Area (OG-D1-08) at Indian Butte to include motorized recreation only on designated routes including one new crossing to connect between roads 2200-306 and 2200-309.
2. Old Growth Management Area (OG-D1-12) at East Porter to include motorized recreation only on designated routes including one new crossing at Looney Creek to connect between roads 4200-430 and 4200-440.

3. Old Growth Management Area (OG-D2-1) near Chamberlin Spring to include motorized recreation only on designated routes including one crossing on closed road 4250-700 to connect between roads 4250-610 and 1200-440.
4. Old Growth Management Area (OG-D2-02) near Deep Creek to include motorized recreation only on designated routes including one new crossing.

Other Information for all Action Alternatives

No action alternative proposes any changes to the current management of motorized winter over-snow recreation.

The following uses are exempted from the proposed motor vehicle use designations:

1. Aircraft;
2. Watercraft;
3. Over-snow vehicles;
4. Limited administrative use by the Forest Service;
5. Use of any fire, military, emergency, or law enforcement vehicle for emergency purposes;
6. Authorized use of any combat or combat support vehicle for national defense purposes;
7. Law enforcement response to violations of law, including pursuit; and
8. Motor vehicle use that is specifically authorized under a written authorization under federal law or regulations, or approved permit.

The use of motor vehicles off the designated system for purpose of big game retrieval would not be allowed. Proposed timing restrictions to mitigate the potential for disturbance during construction and maintenance of trails, or during restoration activities, for various wildlife, fisheries and other resource conditions would be displayed in the Design Criteria section of this EIS.

Resource Protection Measures

The following features are incorporated into the design of alternatives. Project Design Features are sideboards and assumptions that were used in development of specific alternatives. Mitigation measures are those that are site specific, usually have a specific unit(s) assigned to them, and are used to avoid, minimize, rectify, reduce, or compensate an impact (40 CFR 1508.20). For example, a Project Design Feature may include a seasonal closure for an unknown nest site (if discovered); a mitigation measure would place a seasonal closure on a known nest site specific to a trail system. Project Design Features and mitigation measures are used as a basis for determining and disclosing effects in the Environmental Consequences discussions.

Project Design Criteria Common to All Action Alternatives

The Forest Service developed the following design criteria to be used as part of each action alternative.

OHV Trail Design

- The design, construction and management parameters in the following documents will be used as guidelines when designing the OHV trails for this project.

  Forest Service Handbook 2309.18_20

  Off-Highway Motorcycle & ATV Trails Guidelines for Design, Construction, Maintenance and User Satisfaction (Wernex 1994)

  Trail Construction and Maintenance Notebook – 2007 Edition (Forest Service Technology and Development Program 2007)

Trail Planning, Design & Development Guidelines (Minnesota Department of Natural Resources 2006)

Management Guidelines for OHV Recreation (Crimmins 2006)

Sustainable OHV Trails: Layout and Design Clinic (Recconnect 2009)

- Forest Service Handbook identifies trail construction standards as "trail classes." These trail classes are not the same as OHV vehicle classes which coincide with proposed trails described throughout this DEIS as Class I, Class II and Class III trails. Other than in this project design element, in this DEIS Class I trails refer to trails for ATVs with a maximum width of 50"; Class II trails refer to trails for 4x4's (jeeps and buggies) with a maximum width of 80"; and Class III trails refer to trails for motorcycles with a maximum width of 24". Design Element: Trail Management objectives will be developed for each new route designated as part of the Ochoco Summit OHV Trail system. FSH 2309.18_20 design parameters would be used as follows: Trail Class 2 will be used for motorcycle trails; ATV trails will be a mix of Trail Class 2 and Trail Class 3 standards; and Four-wheel drive trails (> 50") will be designed using the Trail Class 2 standard.
- Trails will be designed and managed to offer a variety of rider experiences. This will be accomplished by using a blend of tight and open trails (curvilinear features with a variety of sinuosity) that provide a diversity of settings, speeds and challenges.
- Designated routes utilizing existing road beds or routes will be enhanced (narrowed, roughened, etc.) as needed to increase safety and improve rider experience.
- Trail locations and design will provide views, as well as changes in setting, vegetation, soils and topography to the extent possible.
- Curves may be super-elevated (banked) where practical, using natural terrain, to improve flow of the trail and reduce widening. Native or natural appearing materials will be used where necessary to discourage off trail excursion and to narrow and roughen the trails.
- All trails, except learner loops, will be designated for two-way traffic (single trail width with turnouts).
- Trails will be designed to cross cattle guards on a tangent (perpendicular crossing on a straight segment of trail).
- Trails will be designed to minimize sediment transfer to watercourses by using rolling dips, rolling the grade, and reversing grade to facilitate distribution of water off the trail and to prevent run-off from concentrating and running down the trail. Erosion controlling and water diverting structures will be installed when trail tread modifications are not feasible.
- Water crossings and approaches to water crossings will utilize design elements described for water quality and aquatic organisms (see below).
- Trails will be maintained using hand tools, trail groomers (drag pulled by ATV) and when needed a Sweco trail dozer. Other mechanized equipment, appropriately sized to maintain trail width, may be used if available and/or needed.
- Trail, staging area and kiosk signing will generally conform to the COHVOPS sign plan. To the extent possible, sign colors, shapes and messages will be consistent with other COHVOPS trail systems. Information describing appropriate user behavior and ethics will be provided at all designated Staging Areas and Trailheads. Emphasis will be on using TREAD LIGHTLY! and LEAVE NO TRACE programs to educate the public. Information on hunting

seasons, State of Oregon Hunting and ATV laws, livestock and other safety concerns will be provided at staging areas.

- A designated trail system will incorporate trail rangers, information kiosks, trail maps, and signs. In addition, federal law enforcement officers will enforce the travel management regulations within the project area.
- Compliance and education patrols will be conducted on a regular basis throughout the season of use and intermittently during closed periods.

Transportation

- Where the proposed trail crosses the highway legal only routes, driving safety is a concern for both the OHV rider and the driving public. These intersections will require additional signing for the trail user.
- OHV trail approaches to highway legal only routes will be designed to allow trail users to stop and look both ways prior to crossing the road.
- Supplemental Engineering Analysis will be performed on portions of Roads 1250, 2630, 38, 3810, 4250, 4254, 4270 and 4276 to determine what requirements are necessary to allow for safe use by a mix of highway-legal and non-highway-legal vehicles. As needed, actions (such as brushing or signing) will be taken to meet safe use requirements for mixed use traffic on segments of these roads included in the selected alternative.

Recreation

- Routes intended for motorized travel on the designated trail system will be posted with directional signs.
- Areas intended for motorized travel in “play areas” will have signs posted on boundaries of the designated area.
- Routes not intended for motorized travel that cross designated OHV routes will be identified at crossings with the appropriate trail marker (ie. Nordic ski trail, horse trail, snowmobile trail, or hiking trail markers) so that they are easily identified as not being part of the designated OHV trail system.
- Unwanted unauthorized or user created roads and trails that cross designated OHV routes will be physically closed or concealed to discourage/prohibit motorized use. Examples of closure methods include, but are not limited to, gates or fences, ripping and seeding, recontouring, placement of felled trees, roots and/or rocks, or planting with native trees or shrubs. Physical closures will be implemented over time, in a prioritized order, where resource damage is occurring and/or where sensitive fish, wildlife or rare plant habitats are being affected.
- Any new route designated as part of the trail system will be given a system number.
- A Sign Plan will be developed and on-the-ground signing will be used to clearly identify travel routes and the allowed modes of travel.
- Trails and supporting facilities within visual corridors will be designed to meet Forest Plan Visual Quality Objectives.

Minerals and Geology

- Avoid or minimize disturbance within or adjacent to existing noxious weed infestations. Develop a control plan to prevent weed spread in mineral material sources. This could include fencing and gates to control traffic into active portions of rock pits.

- Access for mining activities will be coordinated with mining claimants as needed. Mining Reference – 36 CFR 228A and 228C, Ochoco NF 1989 Forest Plan S&G Pg. 4-171.

Water Quality and Aquatic Organisms

- Stream approaches must be in an area that has the least grade or steepness perpendicular to the stream. This reduces the length of the crossings and amount of sediment created that could enter streams from trails in RHCAs and allows for proper water drainage to prevent rutting, rilling and/or gullying.
- Where possible utilize reverse grades (low point of trail coinciding with naturally occurring dips or swales to facilitate drainage) when approaching streams in order to minimize runoff down the trail and movement of sediment toward the stream. When reverse grades are used, there must be adequate filtering (distance, vegetation, or geology) between the dip and any active stream channel to prevent movement of sediment into active stream channels.
- Out slope and harden approaches to streams using materials such as concrete blocks or similar materials that strengthen unstable surfaces. These treatments prevent movement of soil, gravels, and other surface materials. Hardening will occur where the trail enters and exits the stream crossing to a gradient break for no more than 100 feet. At this point, construct rolling dips or other cross drainage structures of such size that they would disperse water from the trail and be durable enough to hold up to the expected type and level of traffic. If the trail continues up hill, continue constructing the rolling dips or other cross drainage structures approximately every 50 feet, or where there is a break in grade, to prevent channelizing sediment into streams especially during snow melt, rain events, or rain-on-snow events. This will prevent rutting and movement of surface materials into streams during the wet season, (mid-October to mid-June) (BAER 2006), or during rain events throughout the summer season provided there is sufficient vegetation on the margins of the trail (Welsh 2008).
- Seeps and springs will be managed using Class III and IV RHCAs as specified in INFISH and PACFISH. This includes springs and seeps within dormant landslide terrain. Ochoco NF S&G Mass Wasting (Pg 4-196-197). Reroute trails to avoid meadows, seeps, and springs. If not possible, puncheon stringers need to be elevated above the meadow. This will allow for continuance of vegetation and prevent cutting off flow of water during wet periods, allowing continued access for frogs and other organisms that inhabit the area.
- New construction of Class I, II, and III stream trail crossings or culvert replacement at existing culverts will be bridges or culverts and will meet the Regional (PNW) Aquatic Organism Passage Guidelines (sized for the 100-year flood and pass all aquatic organisms).
- Trail maintenance will not occur during the wet season (mid-October to mid-June) when the potential for soil erosion and water quality degradation exists. Under coordination with the Hydrologist or Fishery Biologist, this restriction could be waived by the Responsible Official under dry conditions and with a specific erosion control plan (e.g. rocking, waterbarring, seeding, mulching, barricading).
- In water work will occur in accordance with the *Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources* (ODFW).
- Water drainage facilities and trail treads on trails in RHCAs will be maintained as needed to avoid trail gullying and erosion that would increase sedimentation into Class I, II and III streams. If rutting, rilling, and gullying do occur, the affected trails (or areas) will be shut down until rehabilitated or until reconstructed to alleviate erosion at affected sites.

- Trail construction including crossings, staging areas or any other construction to occur in the Upper North Fork Crooked River Watershed that are identified in the BAER 2006 (Maxwell Fire) report will be field reviewed for having completed vegetation restoration from the fire before any activity proposed in the OHV EIS is implemented.
- Road Conversion to Trail Forest Service National Best Management Practices Program:
    - Reclaim unneeded road width, cut, and fill slopes when converting a road for future use as a trail.
    - Use suitable measures to stabilize reclaimed sections to avoid or minimize undesired access and to restore a desired ecologic structures or functions.
    - Use suitable measures to ensure that surface drainage will intercept, collect, and remove water from the trail surface and surrounding slopes in a manner that minimizes concentrated flow and erosion on the trail surfaces without frequent maintenance.
    - Use applicable practices of BMP Road-7 (Stream Crossings) to provide waterbody crossings suitable to the expected trail uses. See nos. 3 and 5 above for additional information about stream crossings.
- All fuel-powered vehicles and tools would be refueled at least 75 feet from any live stream.

Soils

- Use of sediment ponds, trenches, weed free straw bales, geotextile fabric or coconut fiber logs/bales, may be used to prevent or reduce the movement of sediment from the project site to stream channels during construction. These materials will be removed or rehabilitated once the site is stabilized in order to create a natural appearance.
- Trails with grades over 20 percent will be designed to prevent erosion. Where incline or decline exceeds 20 percent trails will be treated to harden the surface or by other techniques which meet the objective of reducing rutting and erosion. Techniques include, but are not limited to tread blocks, rock surfacing, soil amendments, rolling dips and/or reverse grades.
- Where possible, rolling grades and outsloping will be used on trails to reduce concentration of flows and minimize accumulation of water on the trail.
- Woody material will be windrowed at the soil surface on the base of trail fill slopes to catch sediment.
- Maintain large coarse woody material along trail edges, keeping rider safety in mind, to maintain the stability of the trail running surfaces.
- Where trails cross scablands treatments to prevent erosion will be implemented. Techniques may vary by trail type and may include but are not limited to rock surfacing or soil amendments.
- Inventories will occur annually to identify and schedule ongoing trail maintenance needed to ensure resource protection and rider safety.

TES Plants

- A rare plant survey and evaluation will be completed prior to trail construction or other disturbance, such as trail maintenance using mechanized equipment, closing of unauthorized roads or trails, culvert installation or removal, etc.

- Protection measures will be put in place so that impacts to rare or sensitive plants will not occur, or impacts will be mitigated to acceptable levels as determined by the District Botanist. Protection measures may include trail relocation, bridges, boardwalks, or erosion control measures listed in other design criteria.
- To protect TES plant habitat, close the trail system when conditions exist that may result in resource damage (rutting, runoff, etc). Coordinate with the District Botanist when determining conditions for trail closure.

Invasive Plants

- Do not route trails, place staging or camping areas, or other disturbance within areas containing invasive plants.
- To avoid potential spread or introduction of invasive plants, actions conducted or authorized by written permit require cleaning of all equipment (ex. trail dozers, excavators, and other construction or trail maintenance equipment) prior to entering Forest Service lands. This includes cleaning before moving to another location on FS land if equipment inadvertently enters an invasive plant site.
- Any OHV or other piece of equipment used for trail construction or maintenance (such as OHV-pulled trail groomers) should be free of mud, dirt, and plant parts prior to entering Forest Service lands.
- Use of weed-free gravel, fill, sand, or other quarry or borrow materials is required for construction and maintenance of trails, staging areas, camping areas, trailheads, etc.
- Use of weed-free straw and mulch is required for all project activities.
- Maintenance activities for the trail network that involve blading, brushing, ditch cleaning, etc. in areas with invasive plants will be done in consultation with the District or Forest-level invasive plant specialist.
- Invasive plants introduced on designated OHV routes will be treated using the early detection/rapid response strategy; and given a high priority status for treatment.
- Trails, trailheads, play areas, staging areas, etc, that become infested with invasive plants may be closed by the Responsible Official until the infestation is controlled.
- Native plant materials are the first choice in revegetation and rehabilitation projects.

Special Habitats

- Avoid designating trails within special habitats where possible. Special habitats include aspen and cottonwood groves, wet meadows, springs and seeps, etc (see Table 129 for acres of special habitats within the project area).
- When trail designation within special habitat is necessary, consult with the District Botanist for the best placement, and other mitigating measures. Remove as little vegetation as possible during trail construction and maintenance.

Bald Eagle and Golden Eagle

- Active nest sites will be protected from disturbing activities within timeframes and distances shown in Table 4.

Table 4. Seasonal restrictions on trail construction and maintenance for active raptor nest sites.

Species	Buffer Distance	Restriction Period
Northern Bald Eagle	½ mile line-of-sight or ¼ mile not line-of-sight	January 1 to August 31
Golden Eagle	1/2 mile	March 1 to August 15
Prairie Falcon	¼ mile	March 1 to August 1
Osprey	¼ mile	April 1 to August 1
Goshawk	¼ mile	March 1 to August 31
Other Raptors	660 feet (10 chains)	March 1 to August 1

- If an active eagle nest is discovered during implementation, efforts will be made to avoid any further disturbance. Site-specific measures will be determined by the Wildlife Biologist. These may include:
  - As needed, trail alignment will be adjusted to provide appropriate buffer type and width for site specific conditions. New construction activities will not occur within 0.25 mile of bald or golden eagle nests. Exceptions will be evaluated on a case by case basis by a wildlife biologist, and may be adjusted based on current protection or management recommendations provided by USFWS and/or ODFW.
  - Restrict activities within 0.5 mile of nest sites from March 1 to August 15 for golden eagles.
  - Restrict activities within 0.25 mile of nest sites (0.5 mile line of sight, 1 mile for blasting) from January 1 to August 31 for bald eagles.

Goshawk

- No management activities, including new trail construction, will occur inside the mapped 30 acre nest stand. As needed, trail alignment will be adjusted to provide appropriate buffer type and width for site specific conditions. Decommissioning of existing routes may occur in nest cores outside of the seasonal restriction period.

- Seasonal restriction (March 1-August 31) on construction, reconstruction, maintenance and decommissioning activities will be used within 0.25 mile of active nests. Seasonal restriction may be waived on an annual basis if an appropriately timed nest inventory determines that breeding is not active. Exceptions will be evaluated on a case by case basis by a Wildlife Biologist.

Other Raptors

- Active nest sites will be protected from disturbing activities within timeframes and distances from active nests as shown in Table 4. No new construction activities will occur within 330 feet of a nest site (primary zone). As needed, trail alignment will be adjusted to provide appropriate buffer type and width for site specific conditions.

- Construction and decommissioning operations will be restricted for both primary and secondary zones (0.25 mile for osprey and prairie falcon, 660’ for other species) between March 1 and Aug. 1 at active nests. Exceptions will be evaluated on a case by case basis by a Wildlife Biologist.

- An evaluation of potential disturbance will be done by a wildlife biologist prior to planned construction, reconstruction, maintenance or decommissioning if a new nest is discovered. Such an evaluation will take into consideration the species involved, topography, the type, intensity and duration of the activity, and other criteria (such as proximity to open roads, visual screening, etc.).

Snags/Down Logs

- To the greatest extent possible the trail system will be designed to minimize tree and snag

felling during trail construction. Retain large (>20” dbh) snags and snag patches to the extent possible during trail lay-out, construction and maintenance.

- Snags that pose a safety hazard which cannot be mitigated will be topped or felled. Safety hazards will be identified by a qualified person, as defined by, and using the procedures provided in the interagency Field Guide for Danger Tree Identification and Response (Toupin et. al., 2008).
- Active nest trees (or snags) located during layout or project implementation will be designated with a wildlife tree marker and protected. If the nest tree is determined to be a safety hazard, coordination with the Wildlife Biologist will occur to determine if the hazard can be mitigated. If the hazard cannot be mitigated, felling of the tree will occur outside of the nesting season after the young have fledged. No felling of trees or snags with visible nests or cavities will occur from March 1 to August 15. Exceptions or waivers will be evaluated on a case by case basis by a Wildlife Biologist.
- To the greatest extent possible the trail system will be designed to minimize loss of large (>20” diameter, large end) down wood habitat during trail construction. To achieve this, trail location should be selected to avoid placement through squirrel middens, sites with hollow logs or old log decks to the extent possible. Where possible conceal unauthorized and unwanted user created trails by scattering woody debris in full length or with roots attached, rather than cutting into shorter pieces. The intent is to retain large wood (>20”) in the longest pieces possible along trails.

Big Game

- Timing restrictions will be placed on project construction, re-construction, decommissioning and maintenance activities from May 15 through June 30 within elk calving areas. These areas were established based upon telemetry data from radio collared elk in the Ochoco Mountains (ODFW), district records and other sources.
- Timing restrictions will be placed on project construction, re-construction, decommissioning and maintenance activities from September 1 through October 15 within 0.25 mile of known elk wallows.
- The Rager Cooperative Travel Management Area (green dot road closure agreement) will remain in effect under all alternatives. Only routes designated as open and specified on the TMA map will be available for travel during the period listed on the brochure for each year. The timing of this restriction varies from year to year and is based on the dates of the rifle hunting seasons, which are determined by Oregon Department of Fish and Wildlife (ODFW). Information on the TMA will be provided at Staging areas and trailheads prior to hunting season each year.
- To the greatest extent possible, OHV trails will be routed away from water sources, mineral licks, wallows, wet meadows and aspen stands.

Range

- Use cattle guards at fence crossings to reduce the frequency of gates being left open and allowing livestock to disperse through pastures and other allotments.
- In range allotments, signs will be posted at staging areas and trailheads to inform all user groups that there are livestock in the area and to be aware of their presence.
- Trail distance from water developments should be at least 100 feet to reduce the potential of collisions between livestock and off-road vehicles.

- Trails will not cross an allotment's fenceline more than two times in order to reduce the amount of fence crossings and necessary cattle guards and to reduce the potential for an increase in the need for fence maintenance by permittees. Exceptions would be coordinated with the Range Conservationist.
- Minimize the length of trail running parallel to and within 20' of pasture fences, in order to prevent impacts to fence stability and condition from use of the trail, and to improve safety.

Cultural

- The need for cultural resource survey will be determined along each of the proposed routes and at each proposed staging area and trailhead. This need will be determined based on extent of previous survey, location of known sites and high probability areas.
- For known and discovered sites, a list of site-specific design elements will be developed and included in a FOIA-exempt file in the project analysis file, and will be made available to the implementation team for this project.
- Cultural resource surveys will be conducted in advance of all ground disturbing actions. Surveys of potentially impacted areas will be done in accordance with the Ochoco Inventory Strategy.
- To the greatest extent possible the trail system will be designed to minimize potential direct and indirect effects to known cultural sites and historic properties.
- During implementation of proposed activities for this project, if cultural materials are discovered, the activity will stop until the District Archeologist or their representative can review the site. If possible, trail alignment will be re-located in order to avoid newly discovered sites. In the event that a site cannot be avoided, then mitigation will be required and will be coordinated by the District Archeologist, or the route will be dropped from consideration and not constructed.
- Where a road is converted to a trail through a site, the narrowing of the trail will be accomplished by methods that maintain the integrity of the site below the surface of the road bed. To avoid disturbance to known sites, use methods to narrow routes that do not involve ground disturbance. These include placement of barriers such as down wood or boulders, limiting the clearing of vegetation or overhanging branches, or defining the width of a trail using fallen trees.
- Decommissioning or concealment of existing unauthorized and unwanted user routes may occur on archeological sites, under coordination with the archeologist and using methods that maintain the integrity of the site below the soil surface. Rehabilitation activities on known sites would use appropriate non-ground disturbing methods such as barriers at or above the soil surface and shallow rooted vegetation.
- Trail routes that are proposed on top of, or crossing over, segments of FS road 2630 will include design features in accordance to the Historic Summit Trail Management Plan and relevant Standards and Guidelines (LRMP 4-61, 4-125, 4-180, 4-182, 4-190, 4-192 to 193).
- Unless limited by topography, trail drainage features would be placed outside of site boundaries. If drainage is required within a site boundary, then mitigation would be implemented as described in the Mitigation section of this document.

Mitigation Measures Common to All Action Alternatives

The following mitigation measures are an integral part of each of the action alternatives. These are different from Project Design Features in that they are typically tied to a specific route, trail or

location and they are used to avoid, minimize, rectify, reduce, or compensate an impact (40 CFR 1508.20). They are listed here separately to avoid repeating them in each alternative description.

The effectiveness of each measure is rated at high, moderate, or low to provide a qualitative assessment of how effective the practice would be in preventing or reducing resource impacts. These mitigation measures and design elements are considered in the effects discussions of Chapter 3.

Effectiveness ratings of High, Moderate or Low are based on the following criteria: a) Literature and Research, b) Administrative Studies (local or within similar ecosystem), c) Experience (judgment of qualified personnel by education and/or experience, d) Fact (obvious by reasoned, logical, response).

> ***High****:* Practice is highly effective (greater than 90 percent), meets one or more of the rating criteria, and documentation is available.
>
> ***Moderate****:* Documentation shows that practice is 75 to 90 percent effective; or logic indicates that practice is highly effective, but there is no documentation. Implementation and effectiveness of this practice needs to be monitored and the practice would be modified if necessary to achieve the mitigation objective.
>
> ***Low****:* Effectiveness is unknown or unverified, and there is little or no documentation; or applied logic is uncertain and practice is estimated to be less than 60 percent effective. This practice is speculative and needs both effectiveness and validation monitoring.

Botanical Resources

To assure protection of a sensitive plant population adjacent to a class I staging area (Alternatives 2 and 4), a structure such as split rail fencing would be used to define the staging area in proximity to the population. *High*

To assure protection of active material Sources from invasive plant introduction and to increase rider safety, active portions of active material sources at Scotts Camp and Six Corners will be fenced (Alternatives 2 and 4). *High*

Cultural

Incorporate data recovery *(high)*, protection *(moderate)*, and/or avoidance *(high)* in eligible and unevaluated cultural resource sites.

Where site recovery information is required, it would consist of a detailed site record, sketches of the site and any artifacts or features present, gathering GPS data for updates to the spatial record, and entering field data into the corporate tabular database. These data are then forwarded to State Historic Preservation Office (SHPO) to complete the consultation process. *High*

Monitoring

The Forest Service believes a well-designed and monitored trail system can provide a positive riding experience for a segment of the public that desires a designated trail system while maintaining various other uses and values of the National Forest lands. The following summary of the planned monitoring within the Ochoco Summit OHV project area includes specific monitoring items identified by resource area:

Soil and Water Quality

- Implementation monitoring and Water Quality monitoring to evaluate the effectiveness of BMPs and INFISH standards and guidelines is included for all the action alternatives.
- Drainage would be monitored prior to opening of the trails to ensure that they are functional during operating season, and after the open season to ensure that they are fully functional going into the winter when the trail is not in use.

- Areas with high erosion potential would be monitored to determine whether design treatments intended to reduce erosion potential were implemented according to plans and that they are effective in achieving desired outcomes. Possible methods include establishment of long term photo points or transects in selected sites to monitor changes in soil depth, displacement and compaction.
- The alternatives include several design elements aimed at reducing the potential for sediment delivery from trails in RHCAs and at stream approaches. Selected reaches would be monitored to evaluate changes in sediment. Baseline water quality data for normal conditions would be established at selected sites, and would be used as a basis from which to measure change. Water quality standards and the amount of acceptable change would be identified. Monitoring would occur along stream courses, springs, wet meadows, and RHCAs to determine whether project design elements were implemented as planned and whether they are effective in meeting protection needs.
- Unauthorized or unwanted user created routes that are closed or decommissioned under this project would be monitored to determine if effective ground cover has become established in order to minimize erosion and sedimentation.

Invasive Plant Species

- High priority areas such as sensitive plant populations, rare habitats, staging areas and parking areas would receive regular monitoring and prevention for invasive plant species presence. If noxious weeds are found, an early detection rapid response strategy for treatment of weeds would be implemented.

Wildlife

- Although no trail systems have been designed to overlap existing known bald eagle nest sites or Bald Eagle Management Areas (BEMAs), periodic monitoring of selected bald eagle nest sites would continue to occur within the analysis area as part of the wildlife monitoring program.
- Although no trail systems have been designed to overlap existing known goshawk core areas or primary zones for other raptors, periodic monitoring of selected raptor nest sites would continue to occur within the project's area of influence as part of the wildlife monitoring program.
- Monitoring and enforcement of system route closures within the Rager Cooperative Travel Management Area would occur. The focus would be during hunting season and would emphasize patrols within the TMA.
- Periodic monitoring of designated routes through special wildlife habitats such as elk calving areas, old growth management areas, pileated woodpecker foraging habitat and goshawk post fledging areas would be conducted to determine if unauthorized or user created routes are developing in a fashion that connects with the designated route. If such unwanted, unauthorized or user created routes are detected then steps would be taken to close, rehabilitate and/or conceal such routes at their intersection with the designated route and at their point of origin.

Range

- As part of a routine maintenance program, monitoring of all fences that are crossed by a designated route would occur during and after trail construction and route designation and periodically after implementation to determine effectiveness and needs for maintenance or repair.

- Monitoring of all water developments that are within ¼ mile of a designated route, trailhead or staging area would occur during and after trail construction and route designation and periodically after implementation to determine if unauthorized routes have developed which need to be closed.
- Monitoring of range designated monitoring areas (DMAs) that are within ¼ mile of a designated route, trailhead or staging area would occur during and after trail construction and route designation and periodically after implementation to determine if unauthorized routes have developed that need to be closed.

Cultural Resources and Site Monitoring Plan

- Monitoring of all sites that are crossed by, or adjacent to, a designated route would occur during and after trail construction and route designation. Following implementation, site visits would occur periodically to ensure that integrity of these sites is being maintained. This would be coordinated by the District or Forest Archaeologist.

Road Management and Public Safety

- The Road Manager(s) would be responsible for monitoring the condition of designated mixed use routes and crossings of open roads, addressing items that may need corrective action associated with timing of maintenance and public safety. Visibility related to adequate sight distance on curves and at intersections and adequate signing would be the focus.

Recreation

- Monitoring would be conducted by Central Oregon Off-Highway Vehicle Operations (COHVOPS) which incorporates agency personnel and volunteers into an integrated education and enforcement program that monitors elements such as sound testing at staging areas and key locations, and rules related to camping and use of the trail system.
- Trail management would include implementation monitoring of trail construction (including all design elements), type(s) of vehicle accessing each trail area and season of use.
- For conversion of road beds to trails, monitoring would be conducted to determine if widths in excess of trail width specifications were adequately rehabilitated with effective ground cover or width controlling devices such as logs or boulders.
- Trails would be monitored annually to determine if improvements need to be made to support intended use and compliance with trail rules.
- Trail Condition Surveys would be conducted annually to determine if repair or restoration needs have arisen. Monitoring would be done both before the trails open for public use in the spring and throughout the open season. These surveys also include checking to determine if unauthorized or user created trails have developed that need to be addressed.
- Stationary sound testing (Society of Automotive Engineers (SAE Standard J1287) of vehicle dB levels would be conducted periodically at all staging areas.
- Ambient sound testing would be conducted periodically in selected areas (such as Walton Lake Basin) during the operating season to determine the effectiveness of the Sound Model and application of the 45 dB level for establishing sound impacts above ambient level.
- Monitoring of campsites at staging areas and trailheads would be conducted to determine if the camp areas are accommodating user needs, and to determine if camp sites need to be defined (placement of physical limits).

- Trail use would be monitored in selected locations via a combination of visual visitor counts at staging areas, traffic counters and trail counters.
- Implementation monitoring results would be available through the Forest Plan Monitoring Report. At the programmatic level, minimum trail plan monitoring would include an annual report of the following:
    - Miles of new trail constructed by user type
    - Miles of trail reconstruction by user type
    - Miles of trail maintained by user type
    - Miles of total trail that meet meaningful measure standards

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). Public comments received in response to the Proposed Action provided suggestions for alternative methods for achieving the purpose and need. Some of these alternatives may have been outside the scope of the purpose and need (to designate a sustainable system of roads, trails and areas open to motor vehicles that will provide legal public access, enhance regulation of unmanaged wheeled motor vehicle travel, protect resources, and decrease conflicts between motorized and non-motorized use on the Ochoco National Forest), duplicative of the alternatives considered in detail, or determined to be components that would cause unnecessary environmental harm. Therefore, a number of alternatives were considered, but dismissed from detailed consideration for reasons summarized below.

A concept utilizing 1 long all-user trail system (80” wide) with short side loops for individual user groups (50” and 24”wide) was explored early in this planning effort. When presented to the Provincial Advisory Committee (PAC) the planning team was told that a long all-user trail would not satisfy the needs or desires of the OHV trail using community. It was suggested that the all-user concept be dropped and separate trail systems developed which would emphasize opportunities and quality for individual user groups. Based on that feedback the all-user central network concept was abandoned and the Proposed Action was developed.

Numerous potential routes were provided by COMAC (Central Oregon Motorcycle and ATV Club). To the extent these routes fit within the sideboards established for this project (refer to Purpose and Need, Chapter 1) the COMAC routes were incorporated into project alternatives. However many of the suggested routes were not included in a fully developed alternative due to conflicts with sensitive resources (sensitive plant habitat, weed populations, fish bearing streams, etc), established uses or recreation emphasis (horse camp, semi-primitive recreation, etc), riparian management objectives or other established land management objectives. For example: a motorized route from the staging area at Ahalt Pit into the Walton Lake Basin and connecting with highway legal roads at Ochoco Creek was found to be inconsistent with objectives for recreational uses at Walton Lake and did not connect with any other trail or mixed use road. Establishing a loop trail between mixed use roads at Walton Sno-Park and Round Mountain was found to be inconsistent with objectives for Round Mountain National Recreational Trail. For these reasons the suggested routes northwest of Walton Lake and south of Walton Sno-Park were not included in a fully developed alternative.

Several options were considered for changing the designation of highway-legal roads under the Forest- level Travel Management Plan, in order to provide mixed use opportunities potentially connecting with trail systems that were being evaluated. The road segments considered included: FS 2630 between the junction with 2200-150 and 2630-450 to connect between the mixed use portions of

2630; FS 2200-150 to connect the staging area at Walton Sno-Park with mixed use portions of the 2630; FS 2200 to connect between trails at Howard Creek and the staging area at Walton Lake; FS 4250 south of the junction with 4256 to a COMAC route coming in from the west; FS 3810 or 4200 to connect between Wolf Creek Campground and the proposed trail network via mixed use roads; a short segment of FS 30 to connect mixed use roads 3000-800 and 4256 and a short segment of FS30 to connect mixed use roads 3000-500 and 4200-450. Due to declining road maintenance budgets and concern for public safety on these high use, high speed roads it was believed that generally the cost of making the changes necessary to make them safe for shared use by traditional and OHV traffic would not be a priority for road and OHV trail maintenance funds. Therefore conversion of highway legal roads to mixed use roads was an alternative that was not fully developed. In some areas parallel trails are included in action alternatives that provide the connections on a constructed trail rather than by putting the OHV onto high traffic roadways. Examples of this are parallel trail on segments along FS 12, 42 and 38 near the Six Corners and Cottonwood Pit Staging Areas, and also along the FS 30 between 3000-500 and 4200-450. In other cases an alternate connection was provided requiring only direct crossing of highway legal roads. Examples of this are connecting loops just east of the FS 30 connection between 4256 and 3000-800 under Alternatives 2 and 4.

Some suggested alternatives were outside of the planning area and were considered to be outside of the scope of this analysis. One of these areas, the McKay Creek watershed could connect to the existing Green Mountain Trail, but it is outside of this analysis area and therefore outside of the scope of this project. Another area that was suggested was FS 5810, which starts in the project area but travels outside of the project analysis area prior to reaching Spanish Peak. This option was considered by the team, but it is outside of this analysis area; therefore, converting this highway legal road to a mixed use road in this area would be outside the scope of this project.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative (see Table 5). Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 5. Comparison of alternatives.

	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
Total miles in Designated System Routes (including mixed-use roads)	0	170	101	212
Total miles of OHV trail	0	124	88	158
Miles of Class I Trail	0	55	35	95
Miles of Class II Trail	0	20	0	18
Miles of Class III Trail	0	49	53	45
Miles of trail not on GIS roads (“new construction”)	0	69	50	84
Number of Dispersed Campsites within which OHV noise from the developed trail system might be greater than 45 db	0	35	18	37
Miles of Dispersed Camping Roads within the >45 db noiseband	0	65	26	73
Miles of Equestrian Endurance Event Route within the >45 db noiseband	0	1.89	1.46	2.12
Miles of Keeton Trail within the >45 db noiseband	0	0.03	0.02	0.02

Table 5. Comparison of alternatives.

	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
Number of Developed Campgrounds within which OHV noise from the developed trail system might be greater than 45 db	0	4	4	5
Acres of Roaded Modified Recreation Opportunity Spectrum within the >45 db noiseband	0	10,837	5,818	12,771
Acres of Roaded Natural Recreation Opportunity Spectrum within the >45 db noiseband	0	1,668	1,059	2,220
Acres of Semiprimitive Non-Motorized Recreation Opportunity Spectrum within the >45 db noiseband	0	276	117	292
Miles of trail system in RHCA	0	18	7	22
Total creek/wetland crossings	0	142	62	170
Class 1 & 2 riparian crossings	0	27	16	27
Class 3 riparian crossings	0	4	5	11
Class 4 riparian crossings	0	76	34	92
Class 9 riparian crossings	0	35	7	40
Increased motorized route density – 6th Field (number of subwatersheds in the analysis area)	0	11 of 30	9 of 30	13 of 30
Acres USFS more than 1/2 mi from motorized route	50,177 (16%)	44,374 (15%)	45,148 (15%)	43,085 (15%)
Acres USFS less than 200 m from motorized route	115,127 (38%)	125,745 (42%)	123,036 (41%)	129,390 (43%)
Acres of elk security habitat (1/2 mi + 250 ac)	47,969 (16%)	42,460 (14%)	42,514 (14%)	41,132 (14%)
Acres hiding cover (>1/2 mi from motorized route)	11,847	11,558	11,465	11,285
Acres thermal cover (>1/2 mi from motorized route)	9,197	9,089	8,978	8,915
Total cover (>1/2 mi from motorized route)	21,044	20,647	20,443	20,200
Miles of system within 660' of hawk/owl nest	0	0.25	0	0
Miles of system within1/4 mi of osprey nest	0	0.6	0.46	0.46
Miles of system within ¼ mi of goshawk nest	0	2.95	1.46	2.78
Miles of system within goshawk post-fledging area	0	5.98	4.13	6.7
Miles of system within Old Growth Management Areas	0	2.59	1.44	2.54
Miles of system within mapped pileated woodpecker feeding habitat	0	2.82	0.68	2.85
Acres and miles of designated trail system in special habitat (Hardwood)	0 acres 0 miles	0.6 acres 0.5 miles	0.6 acres 0.5 miles	0.6 acres 0.5 miles
Acres and miles of designated trail system in special habitat (Meadow)	0 acres 0 miles	2.4 acres 2.02 miles	2.5 acres 2.1miles	4.1 acres 3.35 miles
Acres and miles of designated trail system in special habitat (Rock)	0 acres 0 miles	1.3 acres 1.1 miles	0.7 acres 0.6 miles	1.6 acres 1.3 miles
Acres and miles of designated trail system in special habitat (Shrub-scabland)	0 acres 0 miles	29.1 acres 24.0 miles	10.8 acres 8.9 miles	33.2 acres 27.4 miles
Crossings with highway legal only roads	0	20	16	23
Rehab/Restore sites - user created routes	0	89	54	106
Rehab/Restore sites - decommissioned roads	0	11	7	8

Table 5. Comparison of alternatives.

	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
Rehab/Restore sites – closed roads	0	109	84	163
Estimated Construction Cost	0	$978,500	$759,000	$1,071,000

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This Chapter summarizes the physical, biological, social, and economic environments of the project area and the effects of implementing each alternative on that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in the alternatives chapter.

"Affected Environment" refers to the existing biological, physical and social conditions of an area that are subject to change directly, indirectly, or cumulatively as a result of a proposed human action. Information on the affected environment is found in each resource section under "Existing Condition."

The temporal and spatial scale of the analysis is variable depending upon the resource concern being evaluated. The landscape within the Ochoco Summit OHV Trail System project area boundary is the focus of this EIS, but adjacent lands are considered in this analysis process.

Measures to mitigate or reduce adverse effects caused by the implementation of any of the actions proposed are addressed in Chapter 2, Resource Protection Measures. Effective mitigation avoids, minimizes, rectifies, reduces, or compensates for potential effects of actions. After mitigation is applied, any unavoidable adverse effect to each resource area is addressed in the section titled "Other Disclosures" in this chapter of the EIS.

The following discussion of effects follows CEQ guidance for scope (40 CFR 1508.25(c)) by categorizing them as direct, indirect, and cumulative. The focus is on cause and consequences. Effects exist in a chain of consequences and thus may be labeled "indirect" (occurring later in time or farther in distance, 40 CFR 1508.8(b)), rather than cumulative. For this analysis, in general, direct and indirect effects have been discussed in the context that most readers are accustomed to: those consequences which are caused by the action and either occur at the same time and place, or are later in time or farther removed in distance but are still reasonably foreseeable (40 CFR 1508.8). Cumulative effects are discussed where there is an effect to the environment which results from the incremental effect of the action when added to other past, present, or reasonably foreseeable future actions (40 CFR 1508.7).

Cumulative Effects

There are basically two methodologies the individual resource subjects use in discussing cumulative actions and consequences. The first method would be to describe each individual past, present, and reasonably foreseeable action – including mitigation (cataloging). The second would be to "lump" individual actions if the information regarding those actions would not be useful to illuminate or predict the effects of the proposed action and its alternatives. A mere "cataloging" of effects does not provide the most useful discussion. In some cases, lumping past actions and describing them in terms of "where we are today" can be the most informative. No matter which method is used, it would be formulated to provide the most relevant, useful, helpful, necessary and informative format for the public and deciding official.

The Environmental Consequences disclosures in this EIS include discussion of cumulative effects. Where there is an overlapping zone of influence, or an additive effect, this information is disclosed. In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one can't reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, by focusing on the impacts of past human actions, an analysis may risk ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions do. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions."

The cumulative effects analysis in this EIS is also consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR 220.4(f)) (July 24, 2008), which state, in part:

CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects 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 would 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. Simply 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)..

is merely a listing of past present and foreseeable actions that have potential to overlap the project area. Because the project appears in this table does not necessarily mean it has an additive effect. Each resource specialist has reviewed this table and if there is a past, present, or foreseeable effect, it is disclosed in the individual resource area in Chapter 3.

Table 6. Past, present and reasonable foreseeable future actions.

Project/Event Name	General Description of Activities	Status
Spears Vegetation and Fuels Management	Commercial and non-commercial vegetation management and fuels reduction; hardwood and upland shrub restoration and road management (4.4 miles construction, 11.0 miles reconstruction, 5.9 miles decommissioning),	Implementation
Zane Vegetation and Fuels Management	Manage stand density and fuels within the Zane Project Area (Allen Creek Watershed).	Implementation

Table 6. Past, present and reasonable foreseeable future actions.

Project/Event Name	General Description of Activities	Status
Canyon Fuels and Vegetation Management Project	Commercial and non-commercial vegetation management and fuels reduction; hardwood and upland shrub restoration and road management (0.6 miles construction, 2.0 miles temporary road reconstruction, 4.4 miles reuse of existing temporary roads, 4.9 miles decommissioning, 2.9 miles closure),	Implementation
Ochoco Valley Fuels	Prescribed fire and associated fuels reduction activities in the Ochoco Creek Watershed	Implementation
Gray Prairie Fuels	Prescribed fire and associated fuels reduction activities in the Gray and Lytle Prairie areas of the North Fork Crooked River Watershed	Implementation
Lookout Mountain Prescribed Burn	Prescribed fire and associated fuels reduction activities in the Lookout Mountain Roadless Area	Planning
Deep Watershed Restoration	Proposed stream channel reconstruction, culvert replacements, stream cutbank stabilization, road decommissioning and riparian exclosure fencing along Deep Creek and its tributaries	Implementation
Invasive Plant Treatments (2007)	Deschutes and Ochoco National Forests, Crooked River National Grasslands EIS to reduce the extent of specific invasive plant infestations at identified sites, and to protect areas not yet infested from future introduction and spread of invasive plants species from these sites.	Implementation
Region 6 Invasive Plant EIS (2005)	Implements Standards and Guidelines and prevention strategies to manage invasive plant species	Implementation
Three Trails OHV Project	Proposal to designate approximately 200 miles of trail systems and staging areas near Boundary Springs, Two Rivers, and Crescent Lake Junction. Also would rehabilitate user-created trails. A Deschutes National Forest Plan Amendment would be needed.	Implementation
Umpqua National Forest Travel Management EA (2010)	The proposed action would eliminate cross-country travel, allow motorized use on most of the current open roads, and include approximately 721 miles of OHV trail open to class I and III. Access to dispersed camping would have special provisions to limit access to sensitive areas.	Implementation
Willamette Travel Management Rule Implementation EA (2009)	Motorized travel on the Willamette National Forest would be restricted to designated roads and trails only. Access to dispersed camping would have special provisions to limit access in sensitive areas.	Implementation
Central Oregon Travel Management Project EIS	The Travel Management EIS implements the travel management rule (prohibiting motorized travel off of existing designated routes where it is not currently prohibited) and continue to provide motorized access for dispersed camping. Motorized travel in Central Oregon would be restricted to designated roads and trails only. Access to dispersed camping would have special provisions to limit access to sensitive areas.	Implementation
Cline Buttes Recreation Area Plan EA	Proposal to create a transportation system and recreation facilities on 32,000 acres of BLM lands approximately five miles west of Redmond.	Implementation
Fremont-Winema Travel Management Plan	The proposed action would eliminate cross-country travel, allow motorized use on most of the current open roads, allow OHV use of all of the current miles of OHV trail (only 8.5 miles), and authorize an 80-acre play-area near Klamath Lake.	Planning

Table 6. Past, present and reasonable foreseeable future actions.

Project/Event Name	General Description of Activities	Status
Howard Elliot Johnson Fuels and Vegetation Management Project	Commercial and non-commercial vegetation management and fuels reduction; hardwood and upland shrub restoration, headcut repair and road management (0.4 miles construction, 16.8 miles temporary road reconstruction, 4.4 miles reuse of existing temporary roads, 4.9 miles, and 22.7 miles of closure),	Implementation
Jackson Fuels and Vegetation Management Project	Manage stand density and fuels within the Jackson Project Area (Deep Creek Watershed).	Implementation
Lava Rock OHV System EIS	Proposal to create an OHV trail system on 140,650 acres on the Bend Ft. Rock Ranger District with 154 miles of trails. Proposal includes about 109 miles of Class III, and 45 miles of Class II trails; closure of user created trails in excess of those designated; and closure of level 2 roads in excess of administrative and public access needs.	Planning
Meadow Lake Restoration and Travel Management Project EA (2010)	Sisters Ranger District is proposing a project to focus on restoration of recreation-related impacts to riparian vegetation, fish and wildlife habitat, water quality, and the Santiam Wagon Road. The project would include consideration of providing managed OHV opportunities in the planning area.	Planning
Range Management	The following allotments overlap the analysis area: Burn, Marks Creek, Crystal Spring, Snowshoe, Canyon Creek, Reservoir, Lookout, Brush Creek, Pringle, Antler, Gray Prairie, Lost Horse, North Fork, Fox Canyon, Big Summit, Deep Creek, Roba, Pisgah, Elkhorn, Badger, Indian Creek, Happy, Derr, Little Summit, Wolf Creek, Rock Creek, Bearskull/Cottonwood and Buck Pasture. Twenty-five of the allotments are active allotments, one of which is a sheep allotment. Remaining active allotments are currently grazed by cattle.	Ongoing
Wolf Vegetation and Fuels Management	Proposal for commercial and non-commercial vegetation management and fuels reduction; hardwood and upland shrub restoration and road management being developed under a collaborative process.	Planning
Ochoco Creek Culvert Replacements	Replacement of two undersized culverts on Ochoco Creek to improve function and to allow passage of aquatic organisms	Planning

Deep Creek is a focus watershed as defined by the Forest Service Region 6 Aquatic Restoration Strategy. Proposed restoration projects were identified in the Deep Creek Restoration Plan, some of which have already been implemented. The purpose of the Deep Creek Restoration Plan was to improve overall stream and riparian health and integrity within the watershed and improve water quality and associated habitat suitable for use by redband trout and other aquatic life. The needs for the proposed action are derived from the differences between current conditions and desired conditions, as described in Forest Plan direction and management objectives. A need was identified to:

- Stabilize stream headcutting and streambanks to improve and maintain channel stability
- Remove and/or replace culverts to allow adequate access for fish
- Allow identified riparian areas to recover natural vegetation
- Provide better distribution of livestock
- Improve in-stream fish habitat
- Decrease stream sedimentation

The decision was made to: 1) Replace 35 culverts and 3 culverts with rock fords to allow passage of flood flows and improve upstream access for redband trout; 2) create 7 water developments, 227 acres of grazing exclosures, 342 acres of riparian pasture, and place large wood along 3.6 miles of stream to better distribute livestock, 3) repair 37 headcut complexes and 18 exposed cutbanks, close, decommission, and reconstruct 47 miles of roads, reconstruct 0.25 miles of channel reaches to reduce in-stream sedimentation, and construct 6 in-stream structures to promote pool habitat for fisheries. Most proposed activities are located within RHCAs and were designed to move the watershed towards meeting interim Riparian Management Objectives (RMOs).

Of these activities, the following restoration projects have been implemented thus far:

- In 2006, 2 gates were installed on FR4272-100 and FR4272-400 in Little Summit Prairie Creek Subwatershed;
- In 2006, 2.8 miles of road were decommissioned in the Lower Deep Creek Subwatershed (FR4200-510, FR4200-600, FR4200-603, FR4200608, FR4200630, FR4260-014).
- In 2011, 1.2 miles of road were decommissioned in Little Summit Prairie Creek Subwatershed (FR4270-503, FR4270-504, FR4270-570, FR4276-030, and FR4276-070);
- In 2011, 0.7 miles of road was closed (FR3000-656), 1.6 miles or road were reconstructed (FR3000-650), and 1.5 miles of road were decommissioned in the Lower Deep Subwatershed (FR3000-610, FR3000-653, FR3000-668, FR3000-669, and FR3000-705).

Transportation

Existing Condition

Location and Distribution

Within the Ochoco Summit OHV Trail System project area there are 1,820 miles of road under various private and public jurisdictions that include federal, state, county, and private entities. The existing road system is, in general, evenly distributed throughout the project area, with a somewhat greater abundance of roads being found in the western portion of the project area, in the vicinity the Marks Creek subdivision and Highway 26.

The majority of roads in the project area are located on moderate to gentle terrain, with ground slopes ranging between 15 and 30%. A few roads can be found in mid-slope positions on slopes ranging between 30 and 80%; these roads are scattered across the project area from Shadow Creek to Deep Creek.

Within the project area, there are two Cooperative Road Management Areas established by agreement between the Oregon Department of Fish and Wildlife and USDA-Forest Service and adjacent industrial forest land owners. The Rager Green Dot closure, established by the ODFW, identifies a network of open and closed roads during the fall deer rifle-hunting season in the eastern portion of the analysis on the east end of the Ochoco Mountains, from Sept. 30 to November 29. The South Boundary Closure Area, also within the project area, has a year round closure on roads, established by ODFW. The action alternatives were developed outside of the South Boundary Closure Area. There are portions of all three alternatives within the Rager Green Dot Closure area, requiring seasonal restrictions on portions of the routes.

Age and Development History of the Transportation System

The majority of roads within the project area have been in existence for more than 40 years, with few additions having been constructed in the recent past. Some portions of the system date back to the Summit Trail, which evolved from a pack trail developed with the creation of the Blue Mountain Forest Reserves in 1906.

With limited exceptions (and excluding State and County highways), roads in the Ochoco Summit project area have been constructed for access to timber harvest areas. Some roads were constructed specifically in support of mining and access to private land, primarily around Big Summit and Little Summit Prairies.

Road Use Patterns over Time, Now, and in the Future

The majority of roads within the project area, and in particular those roads under Forest Service jurisdiction, have a general pattern of use common to low-standard forest roads in the absence of residential enclaves or developed recreation. Of the arterial roads and major collector through routes such as Forest Roads 22, 30, 42, 2610, 2630, most roads see little use other than administrative traffic and range permittees through the course of the spring and summer. Timber sale activity can contribute substantially to daily traffic numbers, but the pattern of such activity is usually isolated in one particular area at any given time.

Active sheep and cattle grazing allotments are located within the project area, requiring a small usage component provided by permittee vehicles. The Round Mountain electronic site has frequent visits by the special use permittees and USFS radio maintenance crews. The Crystal Springs church camp, located on the west side of the project area, is in use during the summer months. Vehicle traffic may increase associated with the spring firewood season; the bulk of use for the majority of roads comes in the late summer and fall with the commencement of deer and elk hunting seasons.

Related to recreation, road use is steady with visitors to the cabin rentals at Cold Springs and Ochoco Ranger Station, wild horse/spring flowers/wildlife viewing, and trail head use. Traffic is steady to the developed campgrounds at Walton Lake, Deep Creek and Cottonwood. Fishing at Walton Lake and along the North Fork Crooked River is steady. The project area also has a large visitor interest in endurance ride events and horse camping at Allen Creek Horse Camp and Corral Flats.

The anticipated future use patterns will be somewhat reflective of current trends of primarily administrative and timber sale-related use during the summer, firewood permit use in the spring and increased traffic by hunters in the fall. It would also be anticipated, however, that the selection and implementation of an action alternative in this analysis would result in an increase in recreational traffic during the summer months as a result of increased OHV use.

Primary Destinations of Road System Users

The bulk of the roads within the project area do not generally serve any particular destinations, but instead provide access to areas of interest for various users. For land managers and contractors, these roads serve as access to areas where vegetative management or other land management activities are ongoing or planned. These roads also provide access to popular hunting areas such as Pisgah, Barnhouse Springs, and the Deep Creek area.

Existing Maintenance Levels and Road Surface Types

Operational Maintenance Levels define the degree of maintenance required for a specific road and the level of service which that road provides, consistent with road management objectives and maintenance criteria (FSH 7709.58, Transportation System Maintenance Handbook). The five maintenance levels are defined as:

- **Maintenance Level 1 (M/L 1)**: Assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period must exceed 1 year. Basic custodial maintenance is performed to keep damage to adjacent resource to an acceptable level and to perpetuate the road to facilitate future management activities. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are "prohibit" and "eliminate." Roads receiving level 1 maintenance may be of any type, class or construction standard, and may be

managed at any other maintenance level during the time they are open for traffic. However, while being maintained at level 1, they are physically closed to vehicular traffic, but may be open and suitable for non-motorized uses.

- **Maintenance Level 2 (M/L 2)**: Assigned to roads open for use by high clearance vehicles. Passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Appropriate traffic management strategies are either (1) discourage or prohibit passenger cars or (2) accept or discourage high clearance vehicles.
- **Maintenance Level 3 (M/L 3)**: Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Roads in this maintenance level are typically low speed, single lane with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material. Appropriate traffic management strategies are either "encourage" or "accept" passenger cars. "Discourage" or "prohibit" strategies may be employed for certain classes of vehicles or users; unless otherwise specifically authorized, non-street-legal OHV use is prohibited.
- **Maintenance Level 4 (M/L 4)**: Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated. The most appropriate traffic management strategy is "encourage" passenger cars. However, the "prohibit" strategy may apply to specific classes of vehicles or users at certain times; unless otherwise specifically authorized, non-street-legal OHV use is prohibited.
- **Maintenance Level 5 (M/L 5)**: Assigned to roads that provide a high degree of user comfort and convenience. Normally, roads are double-lane, paved facilities. Some may be aggregate surfaced and dust abated. The appropriate traffic management strategy is “encourage,” except that, unless otherwise specifically authorized, non-street-legal OHV use is prohibited.

The majority of open roads (60%) within the project area are native-surface roads (see Table 7). Those under Forest Service jurisdiction are variously managed as either being open for high-clearance vehicle traffic (M /L 2) or as being physically closed so that traffic is eliminated and the roads are in a basic custodial status (M /L 1) but not prohibited (by Forest Order). There are 252 miles of native-surface roads in Maintenance Level 2 status and they are not maintained on a recurring basis but are instead periodically reviewed to determine whether there are maintenance needs necessary to protect adjacent resource values. Some of the native-surface roads in the project area are on private land and are variably open to public access, depending on the wishes of those individual landowners or the existence of public rights of way (as in the case of subdivisions within the project area).

An additional 37% of the roads are either categorized as improved native or aggregate-surfaced. Most of these roads aren’t specifically maintained for passenger car use but are generally readily usable by such vehicles under most circumstances.

The remaining 3% of roads are asphalt or bituminous-surfaced facilities, including USFS Roads 22 (Walton Lake) and Road 42 (Big Summit Prairie). These asphalt-surfaced routes are under the jurisdiction of the USDA-Forest Service and are maintained to standards that are represented by M /L 4 and 5. Under these maintenance levels, passenger car use is encouraged and the primary emphasis is on traveler comfort, convenience, and safety.

Table 7. Miles of road by maintenance level.

Operational Maintenance Level	Miles
Unclassified Other Jurisdiction	270
M/L 1 (Closed)	669
M/L 2 (High Clearance Vehicles Allowed)	674
M/L 3 (Passenger Car Allowed; Low Speed)	75
M/L 4 (Passenger Car Accepted; Moderate Speed)	13
M/L 5 (Passenger Car Encouraged; High Speed)	37

Within the project area, operation of non-highway legal vehicles is prohibited on those roads classified as M /L 3, 4, or 5; operation of such vehicles is allowed on those roads not maintained for passenger car use (M/L 1 and 2) in accordance with Oregon Revised Statue 821.055. There are also 15 miles of M/L 2 roads, that for safety reasons, have been identified as prohibiting use of non-highway legal vehicles: Rd 2200-150, Rd 2630 (to Indian Prairie), Rd 2630 (Scott's Camp for 2 miles west), Rd 4250, Rd 4270, Rd 4200-740, Rd 38, Rd 3810 and Rd 4276. A total of 659 miles of M/L 2 roads are open to mixed use by highway legal and non-highway legal vehicles.

Existing Road Management Objectives

The existing management objectives for roads within the project area generally call for roads to be managed primarily for land management and administrative purposes; public access is generally allowed but is a secondary consideration except in areas where subdivisions are located or where there is a specific recreation emphasis. The majority of roads that are managed for land management and/or administrative purposes do see a great deal of public usage during hunting season and the open season for firewood cutting. Arterial and collector routes (two- and four- digit roads) are generally managed to facilitate a mix of commercial, administrative, and public use.

With the exception of those roads providing access to recreational facilities or recreational/permanent residences, the seven-digit local road component is managed, when open, to be primarily used by high-clearance vehicles, including OHVs. Passenger car operation is possible on many of these routes, but no special consideration is given to allowing such use. During timber sale activity, these roads are intended to be single-user facilities, given that their narrow travel ways and lack of frequent, intervisible turnouts preclude opportunities to safely provide for mixed commercial/public traffic.

Route Densities

The Ochoco Summit OHV project area lies within portions of 33 separate sixth-field subwatersheds. The total road density for each subwatershed in Table 8 reflects all the open roads, including all jurisdictions, over 861 miles.

Table 8. Road density for 5th and 6th order watersheds, all open roads, mi/mi^2.

Watershed (5th Order)	Subwatershed Name	Operational Open Road (all jurisdictions) Density mi/mi^2
Bridge Creek		1.31
	Headwaters Bridge Creek	0.62
	Middle Bridge Bear Creek	0.94
	Upper Bridge Creek	1.95
	West Branch Bridge Creek	1.78
Deep Creek		1.90
	Jackson Creek	2.15
	Little Summit Prairie	1.91
	Lower Deep Creek	1.50
Lower Beaver Creek		1.60
	North Wolf Creek	0.84
	Wolf Creek	2.06

Table 8. Road density for 5th and 6th order watersheds, all open roads, mi/mi^2.

Watershed (5th Order)	Subwatershed Name	Operational Open Road (all jurisdictions) Density mi/mi^2
Lower North Fork Crooked River		1.27
	Lower North Fork Canyon	0.49
	Upper North Fork Canyon	1.45
Mountain Creek		1.17
	Middle Mountain Creek	1.22
	Upper Mountain Creek	1.14
Paulina Creek		1.89
	Dry Paulina Creek	1.83
	Upper Paulina Creek	1.92
Rock Creek		1.52
	Middle Rock Creek	0.78
	Upper Rock Creek	1.52
Upper North Fork Crooked River		2.34
	Elliot Creek	2.55
	Gray Creek	2.70
	Headwaters North Fork Crooked River	2.07
	Howard Creek	2.28
	Johnson Creek	1.36
	Lower Big Summit Prairie	3.35
	Peterson Creek	2.28
	Porter Creek	2.28
Upper Ochoco Creek		1.66
	Duncan Creek	1.52
	Headwaters Ochoco Creek	1.83
	Lower Marks Creek	2.51
	Upper Marks Creek	1.57
	Wolf Creek	0

User-Created Trails and All Motorized Routes

Over time, a network of motorized trails has developed within the project area. The bulk of these trails can be found between Hwy 26 and the west side of Big Summit Prairie. There is also a group of user-created trails southwest of the prairie, in addition to a network that crosses from the east side of the prairie to the South Fork John Day River and north of Black Canyon Wilderness, outside of the project boundary. These trails were developed largely as the result of all-terrain vehicle (ATV) activity by the seasonal riders who frequent the Ochoco Mountains and by year-round and recreational residents living along Hwy 26. These trails serve essentially as an extension of the official transportation system, providing shortcuts and connectors between existing roads as well as longer cross-country riding opportunities.

The density of user-created motorized trails within the 33 subwatersheds was not calculated. According to the COMAC (Central Oregon Motorcycle and ATV Club) inventory there are potential routes identified: 188 miles of ATV trail, 87 miles of motorcycle and 159 miles of shared use. Approximately 40% of the routes identified are on existing open roads. The miles are concentrated fairly heavily west of Big Summit Prairie, across the top of the prairie and south of the prairie in Gray Creek, Headwaters of the North Fork Crooked and Lower Big Summit Prairie.

Roads Analysis Results and Opportunities

Under all three action alternatives, the following subwatersheds are above the 3 miles/sq. mile density in the General Forest management area: Lower Big Summit Prairie and Lower Marks Creek. Additionally for Alt. 2 and 4: Jackson Creek and Elliot Creek. For Alternative 4, Upper Marks Creek, Porter Creek and Howard Creek are also above the recommended density.

Through previous road analysis efforts, Jackson Creek, Lower Big Summit, Lower Marks Creek and Upper Marks Creek had been addressed under Deep Roads Analysis (1999) and Spears Roads Analysis (2001). Howard, Elliot and Porter Creek were addressed in the 2010 Howard, Johnson, Elliot and Porter Roads Analysis. There were a number of roads proposed to change from open to decommissioned (Table 9) and from open to closed (Table 10 reflects the Level 2 Open Roads proposed for closure, dropping to Operational Maintenance Level 1). With closing and/or decommissioning these roads, the road density will be decreased, adjusting for the increase in proposed trails.

Table 9. Roads proposed for decommissioning under Howard, Johnson, Elliot and Porter Creek Subwatershed Roads Analysis.

Subwatershed	Road No.	Seg. Length (Miles)	Current Opt. Mtnce	Reason	Recommended Operational Mtnc. Level
Elliot Crk	2200-308	0.25	2	Wildlife	Decommission
Elliot Crk	2200-511	0.14	2	Aquatic/Wildlife	Decommission
Johnson Crk	4200-170	0.29	2	Cercla – Amity Mine	Decommission
Johnson Crk	4200-203	0.24	2	Botany/Wildlife	Decommission
Porter Crk	4200-451	0.10	2	Botany/Wildlife	Decommission
Porter Crk	4200-423	0.27	2	Botany/Wildlife	Decommission
Porter Crk	4200-463	0.66	2	Botany/Wildlife	Decommission
Howard Crk	4210-079	0.10	2	Wildlife	Decommission
	TOTAL	2.05 Miles			
TOTAL Miles Proposed To Decommission For Each Subwatershed: • Howard Crk: 0.10 • Porter Crk: 1.03 • Elliot Crk: 0.39 • Johnson Crk: 0.53					

Table 10. Roads proposed to for closure under the Howard, Johnson, Elliot and Porter Subwatersheds Roads Analysis.

Subwatershed	Road No.	Seg. Length (Miles)	Current Opt. Mtnc.	Reason	Recommended Operational Mtnc. Level
Howard Crk	2200-274	.35	1	Aquatic	1
Elliot Crk	2200-306	1.2	2	Aquatic, Wildlife/Botany	1
Elliot Crk	2200-401	0.08	2	Botany	1
Elliot Crk	2200-404	0.5	2	Botany	1
Elliot Crk	2200-405	0.2	2	Botany	1
Elliot Crk	2200-410	0.68	2	Wildlife	1
Elliot Crk	2200-411	0.13	2	Wildlife	1
Elliot Crk	2200-412	0.04	2	Wildlife	1
Elliot Crk	2200-417	0.11	2	Wildlife	1

Table 10. Roads proposed to for closure under the Howard, Johnson, Elliot and Porter Subwatersheds Roads Analysis.

Subwatershed	Road No.	Seg. Length (Miles)	Current Opt. Mtnc.	Reason	Recommended Operational Mtnc. Level
Elliot Crk	2200-418	0.10	2	Wildlife	1
Elliot Crk	2200-422	0.34	2	Botany	1
Elliot Crk	2200-451	0.22	2	Aquatic	1
Elliot Crk	2200-452	0.24	2	Botany	1
Elliot Crk	2200-455	0.21	2	Aquatic	1 (2 segments)
Elliot Crk	2200-457	0.21	2	Aquatic	1
Elliot Crk	2200-458	0.70	2	Wildlife/Aquatics	1 (2 segments)
Elliot Crk	2200-459	0.10	2	Wildlife/Aquatics	1 (2 segments)
Elliot Crk	2200-460	0.54	2	Wildlife/Aquatics	1
Elliot Crk	2200-461	0.13	2	Aquatic/Botany	1
Elliot Crk	2200-462	0.66	2	Aquatic/Botany	1
Elliot Crk	2200-463	0.36	2	Wildlife/Botany	1
Elliot Crk	2200-464	0.33	2	Aquatic	1
Elliot Crk	2200-500	0.30	2	Wildlife	1
Elliot Crk	2200-501	0.63	2	Wildlife/Botany	1
Elliot Crk	2200-503	0.27	2	Botany	1
Elliot Crk	2200-504	0.42	2	Aquatic	1
Elliot Crk	2200-505	1.04	2	Aquatic	1
Elliot Crk	2200-506	0.70	2	Aquatic	1
Elliot Crk	2200-507	1.18	2	Aquatic/Wildlife	11 (2 segments)
Elliot Crk	2200-508	0.49	2	Aquatic	1
Elliot Crk	2200-509	0.32	2	Aquatic/Wildlife	1
Elliot Crk	2200-510	0.10	2	Wildlife	1
Elliot Crk	2200-512	0.48	2	Wildlife	1
Elliot Crk	2200-521	0.18	2	Wildlife	1
Elliot Crk	2230-058	0.21	2	Wildlife	1
Howard Crk	2630-358	0.52	2	Botany	1
Howard Crk	2630-368	0.25	2	Botany	1
Howard Crk	2630-369	0.56	2	Botany	1
Howard Crk	2630-403	0.24	2	Wildlife	1
Howard Crk	2630-408	0.25	2	Wildlife	1
Porter Crk	3000-550	4.78	2	Aquatic	Trail
Porter Crk	3010-095	0.05	2	Wildlife	1
Johnson Crk	4200-153	0.84	2	Aquatic	1
Johnson Crk	4200-175	0.46	2	Aquatic	1
Johnson Crk	4200-227	0.16	2	Wildlife	1
Howard Crk	4200-233	0.56	2	Aquatic	1
	TOTAL	**22.46 Miles**			

TOTAL Miles proposed for closure for each subwatershed:

- Howard Crk: 2.73
- Porter Crk: 4.83
- Elliot Crk: 13.44
- Johnson Crk: 1.46

Table 11 lists the roads proposed for closure or decommissioning by the Deep Roads Analysis and Deep Restoration EIS in the Jackson subwatershed. Their current objective maintenance level is Open

Level 2. Their recommended Objective Maintenance level is identified as Closed Level 1 or Decommission.

Table 11. Roads proposed for closure or decommissioning under Deep Creek Roads Analysis and Deep Restoration Environmental Analysis.

Subwatershed	Road Number	Length (miles)	Current Oper. Mtnc.	Recommended Operational Mtnc. Level
Jackson Creek	3000-900	0.8	2	1
Jackson Creek	2630-770	0.2	2	1
Jackson Creek	3000-656	0.7	2	1
Jackson Creek	3000-754	0.7	2	Decommission
Jackson Creek	3000-756	0.1	2	Decommission
Jackson Creek	2630-770	0.17	2	1
Jackson Creek	4250-606	0.7	2	Decommission
Jackson Creek	4272-400	2.1	2	Close - gate
Jackson Creek	4250-420	0.8	2	1
Jackson Creek	4250-421	0.9	2	1
Jackson Creek	3000-858	0.3	2	Decommission
Jackson Creek	3000-669	0.2	2	Decommission
Lower Deep Creek	3000-745	0.74	2	Decommission
Little Summit Prairie	4274-065	0.1	2	Decommission
TOTAL		**8.51 Miles**		

Table 12 lists the roads proposed for closure by the Spears/Bandit Roads Analysis in 2000. They were not closed under the Spears EIS, so their closure under this project will further reduce the road density in the subwatersheds.

Table 12. Roads proposed for closure under Spears Roads Analysis.

Subwatershed	Road Number	Length (miles)	Current Op. Mtnc.	Recommended in Spears/Bandit RA - Objective Op. Mtnc.
Upper Marks Creek	2600-452	0.38	2	1
	2630-300	0.5	2	1
	2630-302	0.6	2	1
Lower Marks Creek	2610-151	0.15	2	1
	2610-152	0.1	2	1
	TOTAL	**1.73 Miles**		

Table 13 lists the roads proposed for decommissioning by the Spears/Bandit Roads Analysis in 2000.

Table 13. Roads proposed for decommissioning under Spears Roads Analysis.

Subwatershed	Road Number	Length (miles)	Current Op. Mtnc.	Recommended in Spears/Bandit RA - Objective Op. Mtnc.
Upper Marks Creek	2610-012 (0.2-0.56)	0.36	1	Decommission
	2610-012 (0.56-1.0)	0.44	2	Decommission
	2610-018	0.3	2	Decommission
	TOTAL	**1.10 Miles**		

The miles of road proposed for closure or decommissioning from the three Road Analysis efforts would move to further reduce road densities in the watersheds. The roads identified through Deep and Spears are not reflected in the density tables for the action alternatives, only those roads in Howard, Johnson, Elliot and Porter Creek are reflected in the road and trail density tables. The additional miles proposed for closure from Deep and Spears will further reduce density.

Environmental Effects

Alternative 1 (No Action)

Implementation of Alternative 1 would result in no changes from the current conditions in the project area. The mileage of open and closed roads, and the resultant road densities, would remain as they are. Maintenance Level 2 roads would be open for mixed use by both highway-legal and non-highway-legal vehicles, but there would be no roads incorporated as portions of any designated trail system. Non-highway-legal vehicles would be prohibited on all roads maintained for passenger car use (Maintenance Level 3, 4, and 5), plus the Maintenance Level 2 roads added to the list for safety reasons. Use of Maintenance Level 1 roads and user-created roads and trails would be subject to decisions resulting from implementation of the 2005 Travel Management Rule on the Ochoco National Forest.

Effects Common To All Action Alternatives

To varying degrees, each of the three Action Alternatives incorporates the use of National Forest System Roads to provide designated connectivity throughout the project area within and between portions of the designated trail system. Subsequent to the establishment of the 2005 Travel Management Rule, the Regional Forester of the Pacific Northwest Region issued direction that an Engineering Analysis would be required for any National Forest System Road designated for mixed use (allowing use by both highway-legal and non-highway-legal vehicles). As part of implementation of the Travel Management Rule on the Ochoco National Forest, mixed use analysis has been performed to establish the suitability of allowing mixed use on roads; in the context of their current setting in terms of alignment, width, typical user speed, and presence or absence of traffic control devices. Identification of an OHV route system that features numerous specific mixed use roads as part of that system would result in an increase in OHV use on these roads, especially by users who come to the area specifically to ride the system. Such increase would lead to a commensurate increase in the need for maintenance blading on aggregate surfaced roads (particularly on roads that do not normally receive regular blading maintenance), as well as an increased need to monitor the condition of lower standard native surface roads for issues that may need corrective action to be taken either to protect user safety (for example, to address visibility concerns resulting from extreme dustiness on heavily used native surface roads or adequate sight distance on curves and at intersections due to encroaching vegetation) or protect adjacent resources. There would be little to no maintenance for user convenience on these low standard, high clearance vehicle roads unless impassability was to become an issue.

Supplemental analysis has been performed on certain roads in the project area that have been determined to be unsuitable for a mixture of OHVs and highway-legal vehicles because of either their current setting or their designation as roads maintained for passenger car use (on which non-highway-legal vehicle use is prohibited). In particular, this supplemental Engineering Analysis was performed on portions of Roads 2200-150, 2610, 2630, 2630-450, 38, 3810, 4250, 4254, 4270, 4276 and 5810 to determine what requirements would be necessary to allow for safe use by a mix of highway-legal and non-highway-legal vehicles.

For public safety, the roads have been evaluated for mixed use (R. Collins, 2005). A number of the roads have been designed as highway legal only, such as Rd. 42. Where the proposed alternatives cross the highway legal only routes, driving safety is a concern for both the OHV rider and the

driving public. These intersections will require additional signing for both the trail user and the vehicles to encourage safe travel for all users. Table 14 compares the alternatives, with Alternative 4 having the highest number, then Alternative 2, then Alternative 3. Given public safety is a high priority, all the crossings are equally important to protect everyone. The alternatives were designed to cross the highway legal only routes for safety. In Alternative 4, on the Class 3 (motorcycle) route segment on the east side, there is one stretch where the alignment parallels Rd 12 for 1.4 miles. The route is located outside the road prism.

Table 14. Intersections between the alternative routes and highway legal only routes.

Class of Vehicle	Proposed Action Number of Crossings	Alternative 3 Number of Crossings	Alternative 4 Number of Crossings
Class I and III	19	16	22
Class II	1	0	1
TOTAL for each Alternative	**20**	**16**	**23**

Trail and Stream Intersections

For all alternatives, the intersection of the routes and streams was accomplished with a GIS exercise. The identification of the type of stream crossing was based on the stream class. Bridges were identified for all the Class 2 streams and some of the Class 3. Culverts were identified for a good portion of the Class 3 streams. A combination of culverts and fords were proposed for the Class 4 streams. In a few locations, boardwalks were proposed where wet meadows underlie the proposed routes. There were also several areas where the GIS stream alignment and the proposed trail routes intersected an unusually high number of times. Ground checking will most likely show only 1 or 2 intersections. Based on the rough alignment of the proposed routes, the accuracy of the GIS stream routes and the need to verify stream class, the confidence factor for the intersections is 80%. During actual design, the type of stream crossing, location and trail route may be adjusted, but generally within 100 feet of the proposed location.

Seasonal Closure

The Rager Green Dot closure, established by the ODFW, identifies a network of open and closed roads during the fall deer rifle-hunting season in the eastern portion of the analysis on the east end of the Ochoco Mountains. The dates vary from year to year, but generally the closure starts 3 days prior to the controlled buck rifle season and extends through the November Rocky Mountain standard antlerless elk rifle season. In 2012 the dates of the closure are September 26 through November 25. In each of the action alternatives, the routes entering into the Rager Green Dot closure area will have a seasonal closure from the starting date of the Rager TMA closure through the opening date of the season of operation for the proposed trail system (May 1 for Alternatives 2 and 4, or June 1 for Alternative 3).

Alternative 2 (Proposed Action)

Under Alternative 2, a combination of Class I, Class II and Class III routes total 170 miles of new trail system (Table 15). The distribution of the designated OHV trails for this alternative would begin on Hwy 26, passing from Hwy 26 to Walton Lake, across the slope north of Big Summit Prairie to 6 Corners on Paulina District. The proposed system of routes are a combination of existing roads in mixed use Maintenance Level 2 (open), Maintenance Level 1 (Closed) and decommissioned status and new routes.

The proposed routes cross a number of Class 1, 2, 3 and 4 stream systems. As part of the protection for the streams, a combination of bridges, culverts, boardwalks and hardened fords have been proposed. In Alternative 2, there would be an estimated need for 16 bridges, 88 culverts, 6 boardwalks and 33 fords for a total of 142 structures (Table 16).

Table 15. Alternative 2 trail system, miles of existing road and new route by vehicle class.

Type	Class I (ATV)	Class II (Jeep)	Class III (Motorcycle)	Grand Total
Existing Road	37.79	36.51	26.66	100.95
New Route	31.06	12.39	25.67	69.12
Total	68.85	48.90	52.33	170.07

Table 16. Alternative 2 (Proposed Action) crossing type for stream class and vehicle class.

Stream Class/Crossing Type	Vehicle Class I	Vehicle Class II	Vehicle Class III	Total
1/Bridges	4		1	5
1/Culverts	1	1		2
2/Bridges	7		2	9
2 /Culverts	4	2	2	8
2/Boardwalk	2		1	3
3/Ford				
3 /Bridge	1			1
3 /Culvert	2		1	3
4/Bridge	1			1
4 /Culvert	18	22	12	52
4 /Ford	9	8	5	22
4 /Boardwalk	1			1
9/ Culvert	3	19	1	23
9/Boardwalk	2			2
9/Ford	6	4		10
Totals/vehicle class	**61**	**56**	**25**	**142**

Alternative 2 proposes construction of 3 play areas, 6 trail heads, 1 parking area and a total of 10 staging areas split between the three vehicle classes: 6 Staging areas for the Class I (ATV), 2 Staging areas for the Class II (Jeeps) and 2 Staging areas for the Class III (motorcycles). The OHV areas are spread across the proposed trail route.

Implementation of Alternative 2 would result in designation of 45 miles of opened mixed used roads as connecting routes for the trail system. The proposed route also utilizes closed roads and new routes and crosses highway-legal-only routes. There will be options for users with highway legal vehicles to connect to other portions of the trails via highway legal roads.

There would be a lesser increase in maintenance needs on those native surface Maintenance Level 2 roads built to lower standards and intended for use by high clearance vehicles with no expectation of user comfort; maintenance on these roads would primarily consist of correcting issues, such as drainage patterns off of traveled ways, that from increased use and threaten degradation of adjacent resource values.

Alternative 3

Implementation of Alternative 3 would result in 101 miles of trail system being developed from a combination of new route and existing roads currently in Maintenance Level 1 (closed), Maintenance Level 2 (open) or decommissioned status (Table 17). The distribution of the designated OHV trails for this alternative includes a system of Class I vehicle (ATV) trails on the west end of the analysis area, and a separate system for Class III vehicles (motorcycles) on the east end of the analysis area.

Table 17. Alternative 3 Routes for Class I and Class III vehicles, miles.

Type	Class I (ATV)	Class II (Jeep)	Class III (Motorcycle)	Grand Total
Existing Road	23.55	0	34.06	50.60
New Route	31.06	0	28.40	50.32
Total	54.61	0	62.46	100.91

This alternative crosses a number of Class 1, 2, 3 and 4 stream systems. As part of the protection for the streams, a combination of bridges, culverts, boardwalks and hardened fords have been proposed. In Alternative 3, there will be an estimated need for 14 bridges, 27 culverts, 4 boardwalks and 17 fords for a total of 62 structures (Table 18).

Table 18. Alternative 3 Crossing Type for Stream Class and Vehicle Class.

Stream Class/Crossing Type	Vehicle Class I	Vehicle Class II	Vehicle Class III	Total
1/Bridges			4	4
1/Culverts				
2/Bridges	4		3	7
2 /Culverts	2		2	4
2/Boardwalk			1	1
3/Ford	1			1
3 /Bridge			1	1
3 /Culvert	3			3
4/Bridge			1	1
4 /Culvert	5		13	18
4 /Ford	5		9	14
4 /Boardwalk	1			1
9/Bridge	1			1
9/ Culvert	1		1	2
9/Boardwalk	2			2
9/Ford	1		1	2
Totals /vehicle class	**26**	**0**	**36**	**62**

Alternative 3 proposes construction of 4 staging areas: 2 Staging areas for the Class I (ATV), 2 Staging areas for the Class III (motorcycles). The OHV areas are spread across the proposed trail route.

Implementation of Alternative 3 would result in the designation of the least amount of trail, composed of closed roads and new routes. The distribution of the designated OHV trails for this alternative splits into a west side, from Hwy 26 to Walton Lake, and an east side, from east of Big Summit Prairie to Six Corners on Paulina District. Alternative 3 would make the least use of mixed use roads as a key component of the overall system. This would create the least risk for mixed use conflicts and the least need (due to mileage alone) for effective traffic control. There would still be a resulting focus of both highway-legal and non-highway-legal traffic onto other permitted mixed use roads.

Alternative 4

Implementation of Alternative 4 would result in 212 miles of trail being developed from a combination of new route and existing roads currently in Maintenance Level 1 (closed), Maintenance Level 2 (open) and decommissioned road status (Table 19). This alternative crosses a number of Class 1, 2, 3 and 4 stream systems. As part of the protection for the streams, a combination of bridges, culverts, boardwalks and hardened fords have been proposed. The distribution of the designated OHV trails for this alternative begins on Hwy 26, passing from Hwy 26 to Walton Lake, across the slope

north of Big Summit Prairie to 6 Corners on Paulina District, with additional loop trails for Class I, Class II and Class III vehicles. In Alternative 4, there would be an estimated need for 17 bridges, 111 culverts, 4 boardwalks and 38 fords for a total of 170 structures (Table 20).

Table 19. Alternative 4 Class I, Class II and Class III routes, miles.

Type	Class I (ATV)	Class II (Jeep)	Class III (Motorcycle)	Grand Total
Existing Road	79.37	18.55	29.81	127.74
New Route	51.09	11.24	22.15	84.48
Total	130.46	29.79	51.96	212.22

Table 20. Alternative 4 Crossing Type for Stream Class and Vehicle Class.

Stream Class/ Crossing Type	**Vehicle Class I**	**Vehicle Class II**	**Vehicle Class III**	**Total**
1/Bridges	4		1	5
1/Culverts	1	1		2
2/Bridges	8		1	9
2 /Culverts	6	2	2	10
2/Boardwalk			1	1
3/Ford				
3 /Bridge	1			1
3 /Culvert	9		1	10
4/Bridge	1			1
4 /Culvert	36	17	14	67
4 /Ford	17	4	2	23
4 /Boardwalk	**1**			1
9/Bridge	1			1
9/ Culvert	7	15		22
9/Boardwalk	*2*			2
9/Ford	13	2		15
Total by vehicle class	**107**	**41**	**22**	**170**

Alternative 4 proposes construction of 1 play area and a total of 10 staging areas split between the three vehicle classes: 6 Staging areas for the Class I (ATV), 2 Staging areas for the Class II (Jeeps) and 2 Staging areas for the Class III (motorcycles). The OHV areas are spread across the proposed trail route.

Alternative 4 would increase density for open roads and trails for 13 of the 30 subwatersheds.

Cumulative Effects – Transportation System

The combination of past access management decisions to close roads and proposed road closures and road/trail conversions in the action alternatives would result in reduction in the number of road miles open to those highway-legal vehicles that are unsuited for operation on designated trails or whose operators are uninterested or unwilling to operate on those trails. During certain time periods, in particular wood cutting or the various hunting seasons, this would result to some degree in an increase in traffic on the remaining tertiary portions of the road system outside of the designated shared use routes, resulting in the potential need for increased maintenance on those roads. With implementation of the Forest-level Travel Management Rule and any particular action alternative, those remaining open roads would be the sole means of vehicular access to the further reaches of the National Forest Land within and adjacent to the project area.

In particular, Ochoco Creek Roads Analysis, Deep Creek Roads Analysis and Marks Creek Roads Analysis proposed altering a number of miles of Maintenance Level 2 roads to Operational

Maintenance Level 1 (closed) roads. Also within the planning boundary, the Howard/Johnson/Elliot Roads Analysis identified additional miles of road for closure and for decommissioning. These proposed changes to road maintenance levels combine with increased route density under action alternatives in a compensatory fashion. The resulting combination of effects for each alternative is described below. Comparing the three action alternatives, Alternative 3, after construction of the trail, with road closures from other projects, would decrease road density for general forest more than Alternative 2 and Alternative 4.

At the subwatershed scale for Alternative 2 the distribution of proposed trails and changes in Maintenance Level from other proposed actions within the analysis areas would result in a general reduction in total of open road densities, although there would be five subwatersheds – Jackson, Elliot, Lower Big Summit Prairie, Porter Creek and Lower Marks Creek – where open-road density would be increased over No Action Alternative (Table 21). Numbers in parenthesis are the existing road densities.

Table 21. Alternative 2 road density open roads and proposed trails - subwatershed basis.

Watershed	Subwatershed Name	Alt. 2 Operational Open Road and Trail Density	Relative Change from No Action
Bridge Creek (1.29)	Headwaters Bridge Creek	0.62	NC
	Middle Bridge Bear Creek	0.94	NC
	Upper Bridge Creek	1.95	NC
	West Branch Bridge Creek	1.73	DOWN (1.78)
Deep Creek (2.19)	Jackson Creek	2.34	UP (2.15)
	Little Summit Prairie Creek	2.27	UP (1.91)
	Lower Deep Creek	1.84	UP (1.50)
Lower Beaver Creek (1.18)	North Wolf Creek	1.16	UP (0.84)
	Wolf Creek	2.20	UP (2.06)
Lower North Fk Crooked River (1.23)	Lower North Fk. Canyon	0.49	NC
	Upper North Fk. Canyon	1.39	DOWN (1.45)
Mountain Creek (1.15	Middle Mountain Creek	1.18	DOWN (1.22)
	Upper Mountain Creek	1.13	UP (1.14)
Paulina Creek (1.85)	Dry Paulina Creek	1.89	DOWN (1.83)
	Upper Paulina Creek	1.82	DOWN (1.92)
Rock Creek (0.97)	Middle Rock Creek	0.78	NC
	Upper Rock Creek	0.97	DOWN (1.52)
Upper North Fk. Crooked River (2.32)	Elliot Creek	2.43	DOWN (2.55)
	Gray Creek	2.40	DOWN (2.70)
	Headwaters North Fk. Crooked River	1.64	DOWN (2.07)
	Howard Creek	2.18	DOWN (2.28)
	Johnson Creek	1.35	DOWN (1.36)
	Lower Big Summit Prairie	3.01	DOWN (3.35)
	Peterson Creek	2.68	UP (2.28)

Table 21. Alternative 2 road density open roads and proposed trails - subwatershed basis.

Watershed	Subwatershed Name	Alt. 2 Operational Open Road and Trail Density	Relative Change from No Action
	Porter Creek	3.06	UP (2.28)
Upper Ochoco Creek (1.62)	Duncan Creek	1.20	DOWN (1.52)
	Headwaters Ochoco Creek	1.73	DOWN (1.83)
	Lower Marks Creek	2.40	DOWN (2.51)
	Upper Marks Creek	1.96	UP (1.57)
	Wolf Creek	0.03	UP (0)

The overall density of total open 'motorized' routes (comprised of open roads and designated OHV trails) would be slightly less than in the existing condition. The average road densities over a larger area do not reflect the concern for specific management areas. Table 22 identifies the subwatersheds at or above the recommended 3 miles per sq. mile density for wildlife in General Forest based on the net cumulative result of increased route density under the action alternative combined with road closures identified in the other projects described above.

Table 22. Subwatersheds with Open Road and Trail Density at or above 3 miles/sq. mile in General Forest, Alternative 2 combined with closures proposed in other projects.

Watershed	Subwatershed	Management Area – miles/sq. miles
Deep Creek	Jackson Creek	2.95 GF
Upper North Fork Crooked River	Elliot Creek	3.06 GF
	Lower Big Summit Prairie	3.31 GF
	Porter Creek	3.26 GF
Upper Ochoco Creek	Lower Marks Creek	3.15 GF

At the subwatershed scale for Alternative 3, the distribution of proposed trails and changes in Maintenance Level from other proposed actions within the analysis area would result in a general reduction in total and open road densities, although there would be two subwatersheds –Lower Big Summit Prairie and Lower Marks Creek – where open-road density would be still be over 3 miles/sq. mile (Table 23). Numbers in parenthesis are the existing road densities.

Table 23. Alternative 3 Road Density – Subwatershed (Mile/Square Mile).

Watershed	Subwatershed Name	Operational Open Road and Trail Density	Change from Existing Condition
Bridge Creek (1.29)	Headwaters Bridge Creek	0.62	NC
	Middle Bridge Bear Creek	0.94	NC
	Upper Bridge Creek	1.95	NC
	West Branch Bridge Creek	1.73	Down (1.78)
Deep Creek (1.95)	Jackson Creek	1.92	Down (2.15)
	Little Summit Prairie Creek	2.19	Up (1.91)
	Lower Deep Creek	1.72	Up (1.50)
Lower Beaver Creek (1.18)	North Wolf Creek	1.16	Up (0.84)
	Wolf Creek	2.20	Up (2.06)
Lower North Fk Crooked River (1.23)	Lower North Fk. Canyon	0.49	NC
	Upper North Fk. Canyon	1.39	Down (1.45)

Table 23. Alternative 3 Road Density – Subwatershed (Mile/Square Mile).

Watershed	Subwatershed Name	Operational Open Road and Trail Density	Change from Existing Condition
Mountain Creek (1.12)	Middle Mountain Creek	1.18	Down (1.22)
	Upper Mountain Creek	1.09	Down (1.14)
Paulina Creek (1.85)	Dry Paulina Creek	1.89	Down (1.45)
	Upper Paulina Creek	1.82	Up (1.83)
Rock Creek (0.97)	Middle Rock Creek	0.78	NC
	Upper Rock Creek	0.97	Down (1.52)
Upper North Fk. Crooked River (2.10)	Elliot Creek	2.12	Down (2.55)
	Gray Creek	2.40	Down (2.70)
	Headwaters North Fk. Crooked River	1.64	Down (2.07)
	Howard Creek	2.01	Down (2.28)
	Johnson Creek	1.35	Down (1.36)
	Lower Big Summit Prairie	3.01	Down (3.35)
	Peterson Creek	2.16	Down (2.28)
	Porter Creek	2.33	Up (2.28)
Upper Ochoco Creek (1.77)	Duncan Creek	1.21	Down (1.52)
	Headwaters Ochoco Creek	1.67	Down (1.83)
	Lower Marks Creek	2.40	Down (2.51)
	Upper Marks Creek	2.64	Up (1.57)
	Wolf Creek	0.03	Up (0)

The overall density of total open 'motorized' routes (comprised of open roads and designated OHV trails) would be slightly less than the existing condition. The average road densities over a larger area do not reflect the concern for specific management areas. Table 24 identifies the subwatersheds that are at or above the recommended 3 miles per sq. mile density for wildlife under General Forest based on the net cumulative result of increased route density under the action alternative combined with road closures identified in the other projects described above.

Table 24. Subwatersheds with Open Road and Trail Density at or above 3 mi/sq. mi in General Forest, Alternative 3 combined with closures proposed in other projects.

Watershed	Subwatershed	Management Area – miles/sq. miles
Upper North Fork Crooked River	Lower Big Summit Prairie	3.01 GF
Upper Ochoco Creek	Lower Marks Creek	2.40 GF

At the subwatershed scale for Alternative 4, the distribution of proposed trails and changes in Maintenance Level proposed by other actions within the analysis area would result in a general reduction in total of open road densities, although there would be three subwatersheds –Lower Big Summit Prairie, Porter Creek and Lower Marks Creek – where open-road density would be increased over No Action Alternative (Table 25). Numbers in parenthesis are the existing road densities.

Table 25. Alternative 4 Road Density - Subwatershed Basis.

Watershed	Subwatershed Name	Operational Open Road and Trail Density	Relative Change from No Action
Bridge Creek (1.31)	Headwaters Bridge Creek	0.62	NC
	Middle Bridge Bear Creek	0.94	NC
	Upper Bridge Creek	1.95	NC
	West Branch Bridge Creek	1.78	NC
Deep Creek (2.35)	Jackson Creek	2.56	Up (2.15)
	Little Summit Prairie Creek	2.39	Up (1.91)
	Lower Deep Creek	1.97	Up (1.50)
Lower Beaver Creek (1.87)	North Wolf Creek	1.16	Up (0.84)
	Wolf Creek	2.29	Up (2.06)
Lower North Fk Crooked River (1.23)	Lower North Fk. Canyon	0.49	NC
	Upper North Fk. Canyon	1.39	Down (1.45)
Mountain Creek (1.18)	Middle Mountain Creek	1.18	Down (1.22)
Mountain Creek	Upper Mountain Creek	1.23	Up (1.14)
Paulina Creek (1.85)	Dry Paulina Creek	1.89	Up (1.82)
	Upper Paulina Creek	1.82	Down (1.92)
Rock Creek (0.97)	Middle Rock Creek	0.78	NC
	Upper Rock Creek	0.97	Down (1.52)
Upper North Fk. Crooked River (2.35)	Elliot Creek	2.39	Down (2.55)
	Gray Creek	2.40	Down (2.28)
	Headwaters North Fk. Crooked River	1.64	Down (2.07)
	Howard Creek	2.40	Up (2.28)
	Johnson Creek	1.35	Down (1.36)
	Lower Big Summit Prairie	3.01	Down (3.35)
	Peterson Creek	2.70	Up (2.28)
	Porter Creek	3.13	Up (3.35)
Upper Ochoco Creek (1.92)	Duncan Creek	1.21	Down (1.52)
	Headwaters Ochoco Creek	1.72	Down (1.83)
	Lower Marks Creek	2.42	Down (2.51)
	Upper Marks Creek	3.19	Up (1.57)
	Wolf Creek	0.03	Up (0)

The overall density of total open ‘motorized’ routes (comprised of open roads and designated OHV trails) would be slightly less than in the existing condition. The average road densities over a larger area do not reflect the concern for specific management areas. Table 26 identifies the subwatersheds at or above the recommended 3 miles per sq. mile density for wildlife in General Forest based on the net cumulative result of increased route density under the action alternative combined with road closures identified in the other projects described above.

Table 26. Subwatersheds with Open Road and Trail Density at or above 3 miles/sq. mile in General Forest, Alternative 4 combined with road closures proposed in other projects.

Watershed	Subwatershed	Management Area – miles/sq. miles
Deep Creek	Jackson Creek	3.0 GF
Upper North Fork Crooked River	Elliot Creek	3.01 GF
	Howard Creek	3.0 GF
	Lower Big Summit Prairie	3.31 GF
	Porter Creek	3.27 GF
Upper Ochoco Creek	Lower Marks Creek	3.22 GF
	Upper Marks Creek	3.27 GF

This document reflects the current route information in the database with limited field visits. The final routes developed, following the alternative selection, may vary slightly from the location identified on the alternative maps. The specific stream crossings may move slightly, depending on reasonable design location.

Recreation

Introduction

Off-highway vehicle (OHV) recreation is allowed on National Forest System lands in appropriate places and under proper management (Forest Service Manual 2355.03). The Ochoco National Forest Plan, as amended, permits motorized travel on designated routes.

In 1996, the Ochoco National Forest completed a Trail System & Off-Highway Vehicle Management and Development Environmental Impact Statement in response to issues that included the growing popularity of off-highway vehicles and an increased demand for OHV recreation trail opportunities on the Forest and Crooked River National Grassland. At that time it was estimated that use on the Ochoco's only designated OHV trail (Green Mountain) had increased 5-10% annually during the previous five years. The document indicated that more OHV trail opportunities were needed near Prineville, Madras and Burns to provide high quality OHV experiences and to reduce the amount of off-trail riding that was occurring (USDA Forest Service, 1996).

Use of ATVs for recreation in Oregon is increasing. The Oregon Parks and Recreation Department (OPRD) expected to sell approximately 85,000 OHV stickers valid for two years in 2010 (Oregon Parks and Recreation Department 2009). Cordell et al. (2008) also reports on the remarkable growth of OHV use in the United States. According to the OHV IRIS (Internet Research Report Series)[3] report, regional and national OHV use days have increased 42 percent from 2001-2007 (Cordell, 2008). Parallel trends in local OHV use have been noted locally with the population growth of Central Oregon. Increased OHV use and related impacts have been observed by Forest Service personnel as well as by other agencies, non-governmental organizations (NGOs) and the general public. Similar situations have occurred throughout the nation, leading to the Travel Management Rule that governs OHVs and other motor vehicle use on National Forests and Grasslands. At the time of the first U.S. National Recreation Survey in 1960, OHV recreation was not included as a reportable activity (Cordell et al. 2008a). OHV use today, however, is among the fastest growing outdoor activities. Although the economy over the recent years has likely affected the recent dip in OHV use and sales locally and nationally, it is believed the overall trend for increase in use would continue. Nationally, the number of people (16 years of age and older) who report participating in OHV sports is over 44 million. Annual OHV sales more than tripled between 1995 and 2003 (sales have leveled off since

[3] Off-Highway Vehicle Recreation in the United States and its Regions and States: A National Report from the National Survey on Recreation and the Environment (NSRE) February, 2008 by: H. Ken Cordell, Carter J. Betz, Gary T. Green, and Becky Stephens.

2003). Total OHV ownership of newly purchased and previously purchased machines increased 174 percent between 1993 and 2003, from fewer than three million to more than eight million vehicles. ATVs (not counting full-size, 4-wheel drive vehicles) account for about 70 percent of all OHVs (Cordell 2008). Based on survey data and sales trends, Cordell projected that there could be as many as 9.8 million ATVs and off-road motorcycles in the US in early 2008 (Cordell et al. 2008a).

After two years of consultation and collaboration, the State of Oregon published The Oregon Trails 2005-2014: A Statewide Action Plan. For the North Central Trails Planning Region, which includes the Ochoco Summit OHV planning area, the report lists that the top regional motorized trails plan issues are:

A. Use of snow park areas for OHV recreation during summer months (this currently occurs at Walton Sno-Park on the Ochoco National Forest);

B. Closure or elimination of OHV trails within the region as a result of resource damage;

C. Need for more Class II (4-wheel drive jeeps, SUVs) riding opportunities in the region, including a wide variety of Class II riding opportunities, and particularly technical riding areas.

In addition to the statewide action plan, a study conducted by the State of Oregon (2005) found a trend for closing existing riding opportunities within the region (Bergeson et al. 2005).

Visitor Use Monitoring

The National Visitor Use Monitoring (NVUM) survey, which is conducted every five years, collects information on National Forests and Grasslands about visitor use and satisfaction (USDA Forest Service 2009c). Data collected during this effort can be used to display the percent of use of the National Forest by activity. NVUM data reflect local use, but are a snapshot in time for one calendar year and may not reflect the true visitation to the National Forest because of factors such as weather, time, date, or economic conditions at the time of the sample. The first round of NVUM surveys for the Forest was conducted between October 1, 2000, and September 30, 2001; the second round was conducted between October 1, 2007, and September 30, 2008.

The National Survey on Recreation and the Environment (NSRE) data reflect information gathered in a 1999-2007 survey (Cordell et al. 2008). NSRE data do not reflect local use, but provide national data from a larger and more frequent sample.

National use may not be a clear indicator of local use; for example, the 2008 NVUM data show that 2.1 percent of visitors to the Ochoco National Forest used an OHV for recreation sometime during their stay, whereas on a national level, 19 percent of visitors used an OHV during the measured timeframe (1999-2007). In 2008, Ochoco visitors that hiked for the day (47.1 percent) more closely matched up with the national average (35.4 percent). Table 27 summarizes findings from the 2008 NVUM and the NSRE surveys.

Table 27. 2008 Ochoco National Forest activity participation and primary activity (NVUM) and national user participation (NSRE) in comparable recreation activities.

Activity	National Visitor Use Monitoring (NVUM) Data (2008)			National User Participation (NSRE) Data	
	% Participating	% As Main Activity	Estimated total # Participating (based on an estimated total visitation of 247,000)	% All Users Participation	% All OHV Users
Backpacking	2.3	1.6	5681	11.4	19.9
Bicycling	1.8	0.6	4446	22	34.4
Cross-country Skiing, snow shoeing	5.2	1.5	12844	4.8	6.7
Day Hiking, walking	47.1	14.5	116337	35.4	47.9
Developed Camping	10.5	7.1	25935	29.1	44.7
Downhill Skiing, snowboarding	5.2	1.5	0	9.2	14.8
Driving for Pleasure	22.1	5.3	54587	59.1	86.3
Family Gathering Outdoors	no data	no data	0	76.2	84.9
Fishing	6.4	6.3	15808	24.5+	44.6+
Gathering Forest Products	5.8	4.5	14326	32.5	52
Horseback Riding	3.6	3.3	8892	8.7	16.8
Hunting	19.1	18.6	47177	10.0+	28.4+
Motorized Water Activities	2	0.2	494	28.5+	46.9+
Nature Center Activities	3.3	0	8151	61.8	69.5
Nature Study	8.4	0.1	20748	no data	no data
Non-motorized Water	0.7	0.1	1729	11.2+	21.4+
OHV Use	0.6	0.2	1482	19	100
Other Motorized Activities	0	0	0	no data	no data
Other non-motorized	5.7	2.6	14079	no data	no data
Picnicking	10.6	3.2	26182	58.9	65.2
Primitive Camping	5.3	3.6	13091	17.8	17.8

Table 27. 2008 Ochoco National Forest activity participation and primary activity (NVUM) and national user participation (NSRE) in comparable recreation activities.

Activity	National Visitor Use Monitoring (NVUM) Data (2008)			National User Participation (NSRE) Data	
	% Participating	% As Main Activity	Estimated total # Participating (based on an estimated total visitation of 247,000)	% All Users Participation	% All OHV Users
Relaxing	29.1	3.3	71877	no data	no data
Resort Use	0.3	0.3	741	no data	no data
Snowmobiling	15.5	14	38285	4.3	4.3
Sightseeing	no data	no data	0	58.5	58.5
Viewing Natural Features	35.9	12	88673	66.5	66.5
Viewing Wildlife	38.8	0.9	95836	51.4	51.4
Visiting Historic Sites	1.3	0	3211	51.5	51.5
Walking for Pleasure	no data	no data	0	86.2	86.2
Motorized Trail Activities	5.2	2.9	12844	no data	no data

NVUM data source is the second round of National Visitor Use Monitoring surveys (Kocis et al. 2003). NSRE data source is 1999-2007 survey information for the National Survey on Recreation and the Environment (Cordell et al. 2008).

"No data" indicates that there was no direct cross-walk between NVUM and NSRE.

"+" indicates that the activity participation rate is higher than indicated because of participation in variations of the activity that were reported separately.

As shown in Table 27, the top five recreation activities of visitors to the Ochoco National Forest in 2008 were day hiking/walking, viewing wildlife, viewing natural features, relaxing, and driving for pleasure. Each visitor also indicated his or her primary activity for the current recreation visit to the forest. The top primary activities were, hunting, day hiking/walking, snowmobiling, viewing natural features, and developed camping, viewing wildlife/nature.

Primary OHV users also participate in a variety of other recreation activities during their forest visit (USDA Forest Service 2006b). In Washington and Oregon, the most popular secondary activity for primary OHV users is developed camping (see Table 28). Relaxing and viewing natural features also had high participation rates. From the preceding table, a relationship can be obtained using the last column to compare secondary activities for primary OHV users on a national level. For example, 44.7 percent of primary OHV users camp in developed sites, compared to 49.9 in Oregon and Washington.

Table 28. Secondary Activities Reported by Primary OHV Users in the Pacific Northwest Region of the Forest Service.

Activity	% of Primary OHV Users
Developed Camping	49.9
Relaxing	46.5
Viewing Natural Features	46.2
Viewing Wildlife	24.4
Hiking/Walking	20.4
Driving for Pleasure	16.7
Gathering Forest Products	9.5
Primitive Camping	6.0
Fishing	2.0
Visiting Historic Sites	0.0
Hunting	0.0
Data source is the first round of National Visitor Use Monitoring surveys (USDA Forest Service 2006b).	

Motorized Recreation Use and Trends

Oregon State Law allows OHVs to travel on one-lane gravel and native-surface roads (Oregon Parks and Recreation Department 2009). Over 1,388 miles of road are available for OHV use on the forest to all classes of vehicles. Approximately 659 miles of Maintenance Level II road (252 miles of which are native surface) within the Ochoco Summit planning area are open to OHV use. Native surface, high clearance roads are more likely to be attractive routes for OHVs than roads with aggregate surface. Some of these native surface roads are primitive and rough, while others are relatively smooth and offer little or no technical challenge. Class I and III OHVs are also permitted on roughly 27 miles of designated trails for OHVs on the Ochoco National Forest, including the 8.5 mile Green Mountain OHV trail on the Lookout Mountain Ranger District. None of these designated motorized trail miles occur within the analysis area. Although the extensive road system and motorized trails provide motorized access for many types of vehicles, roads and designated trails do not always provide the recreational experience that many people seek or the connectivity to desired destinations such as favorite campsites, vistas, people's homes, or community services.

Several public land management agencies manage more than 40 designated OHV sites and areas in Oregon. Given the willingness of OHV users to drive substantial distances to recreate (Bergerson et al. 2005), many of those who use the existing routes in Central Oregon for OHV recreation probably also use these other areas either instead of or in addition to Forest routes. NVUM reported substitute choices made by OHV users if they were unable to use National Forest System lands. About 64 percent of primary OHV users in the Pacific Northwest responded that they would go somewhere else for the same activity (English et al. 2004).

The 2004 Oregon Statewide Motorized Trail Use Survey revealed that OHV enthusiasts are willing to travel reasonably long distances to pursue their most frequent activity (Bergerson et al. 2005). The median distance traveled to reach an OHV riding opportunity falls in the range of 41 and 50 miles, and nearly one-fifth of OHV users travel more than 100 miles. Considering only OHV opportunities on National Forest system lands, the median distance traveled is over 200 miles (USDA Forest Service 2006).

The Malheur National Forest lies to the east of Paulina Ranger District. The Malheur Forest boundary is not adjacent to the Ochoco National Forest, and there are no Forest roads that are open to mixed use connecting the two Forests. There are some connecting routes open to highway-legal vehicles. As

with all national forests, the Malheur National Forest is implementing the Travel Management Rule. There is public land managed by the Prineville BLM adjacent to many areas of the Ochoco National Forest boundary. Some BLM roads are open to OHV use, and some areas have developed trail systems and play areas that are open to cross country travel.

The Oregon Back Country Discovery Route is over 950 miles and is a mostly-graveled route across the eastern part of Oregon, from Cave Lake, California to Walla Walla, Washington. A portion of route 4 traverses the project area making a connection from Seneca to Prineville. Although the State of Oregon no longer can refer to it as a designated route, maps remain available through a private source (www.oohva.org)

In Oregon, ATV riding (three and four wheel vehicles) is by far the most popular type of OHV use, reported by 40 percent of OHV users as their favorite activity (Bergerson et al. 2005). Seventy percent of Oregon households that participate in OHV sports report that they rode an ATV in 2004 (Table 29). Many households participate frequently. The State survey did not ask how many individuals in the household participated in each activity, so no figure for total participation is estimated by this source.

Off-road motorcycling is reported to be the favorite activity by 44 percent of OHV users (Table 29). Forty-four percent and 29 percent of OHV users favor four-wheel driving with stock vehicles and with modified vehicles, respectively. Modified 4-wheel drive vehicles have modified tires and/or suspension upgrades.

Table 29. Frequency of Motorized Trail Participation in Oregon among Households Reporting OHV Participation.

Activity	Participated in the Last Year (percent)	Estimated Oregon Households	Of Participants in Last Year, How Often? (percent)			
			Weekly	2-3/ Month	Once/ Month	Less Often
ATV riding (3 & 4 wheel)	70	68,600	12	34	19	34
Off-road motorcycling	44	43,100	16	29	20	35
4-wheel driving (stock)	44	43,100	21	24	24	31
4-wheel driving (modified)	29	28,400	21	21	33	24
Data is from the 2004 Oregon Statewide Motorized Trail User Survey (Bergeson et al. 2005).						

Residents from the counties that visit the Ochoco Summit project area most often (Deschutes, Crook, Jefferson, Multnomah) state that ATVs (Class I) are also the most popular OHV; Class III OHVs (motorcycle) ownership ranges from 17 to 27 percent for these counties (Table 30). Lane County departs from ownership patterns for Class II OHVs (jeeps, side-by-sides, etc) by having 22 percent of permits for these vehicles, whereas the other counties show 11 percent (Lindberg 2009).

Table 30. OHV Ownership, Permits, In-state, by County, Percent of County Ownership by Class (Lindberg 2009).

	Class I (ATV)	Class II (jeep, side-by-side, etc.)	Class III (motorcycles)	Total
Oregon Total	61%	18%	21%	100%
Crook	72%	11%	17%	100%
Deschutes	61%	11%	27%	100%
Klamath	72%	11%	17%	100%
Lane	59%	22%	19%	100%
Excerpted from : The Economic Impacts of Off-Highway Vehicle (OHV) Recreation in Oregon: Rider Demographics and Preferences Report, Prepared for the Oregon Parks and Recreation Department: July 8, 2009, Kreg Lindberg				

Recreation Niche

The recreation niche is a description, or characterization, of the distinct role each forest plays in providing outdoor recreation opportunities, experiences, and benefits. The niche is determined by public expectations (demand) and by the ecological capabilities of the land. The niche allows managers to focus management efforts on what is unique and valuable about the Forest. In 2006, the Ochoco National Forest developed a recreation niche statement, mapped where the public recreates, and translated the map into a narrative about the relative importance of the Forest for various recreation opportunities, experiences, and benefits. The wide variety of visitor preferences and uses were grouped into two spatial categories (settings):

- The Backyard – Located closest to the more populated communities, it provides nearby neighbors and families easy access to the Forest and Grassland, giving them the opportunity to spend an hour or spend the day.
- The Back 40 - Adjacent to working ranches and located further from larger population centers, it offers a remote experience and allows for self-discovery and finding one's own special place on a variety of roads and trails from highway to hiking.

The recreation niche indicates that each of these settings could provide opportunities for well-managed designated OHV areas and that this setting is appropriate for OHV use and OHV trailheads. The Ochoco Summit OHV planning area is located primarily in the Back Forty setting.

Central Oregon OHV Operations (COHVOPS)

The Forest Service and the Bureau of Land Management (BLM) have combined forces to manage the Central Oregon off highway vehicle trail systems through a program called Central Oregon Off-Highway Vehicle Operations (COHVOPS).

The mission of COHVOPS is to provide consistent, quality off-highway vehicle recreation opportunities that are focused on customer service and resource protection. COHVOPS manages the Central Oregon OHV trail systems for the Deschutes and Ochoco National Forests and the Prineville BLM. This includes operations, maintenance, monitoring, patrolling, user education, and law enforcement. The team implements existing OHV management plans, identifies future needs, recommends actions to management, and assists in future OHV planning efforts. COHVOPS is funded through a combination of direct support from the Forest Service, the Bureau of Land Management (BLM), and grant funding from the State of Oregon derived from the ATV Allocation Funds derived from the ATV Permit program and a portion of gas tax revenue.

Existing Condition

The Ochoco Summit project area has a variety of recreation opportunities to offer, ranging from developed campgrounds and trails to primitive settings for dispersed recreation. Walton Lake Campground is the largest developed recreation site in the project area. There are several streams that provide fishing opportunities. Hunting is a very popular activity with over 19% visitor participation (NVUM, 2009). Other recreation opportunities include hiking, mountain biking, camping, bird-watching, scenic viewing, snowmobiling and cross-country skiing.

Developed Recreation

Developed recreation sites managed by the Lookout Mountain and Paulina Ranger Districts of the Ochoco National Forest includes 22 campgrounds, 4 picnic (day-use) sites, 23 trailheads, 2 rental cabins, 4 horse camps, 3 snow parks, and other minor sites. Developed recreation sites located within the project area are displayed in Table 31.

Developed sites that are located within ½-mile of the proposed trail systems are Ochoco Divide Campground, Ochoco Divide Sno-park, Wildwood Campground, Walton Lake Campground, Scotts Camp, Allen Creek Horse Camp, Big Springs Campground, Cottonwood Pit, and Keeton Trailhead.

Table 31. Developed recreation sites within the Ochoco Summit OHV Trail System project area.

Site Name	Campground	Trailhead	Sno-park
Walton Lake	**X**		
Ochoco Divide	**X**		
Ochoco Forest Camp	**X**		
Wildwood	**X**		
Scotts	**X**		
Allen Creek Horse Camp	**X**		
Deep Creek	**X**		
Big Springs	**X**		
Biggs Spring	**X**		
Cottonwood	**X**		
Cottonwood Pit	**X**		
Barnhouse	**X**		
Wolf Creek	**X**		
Sugar Creek	**X**		
Walton Lake		**X**	
Lookout Mountain		**X**	
Round Mountain		**X**	
Independent Mine		**X**	
Baneberry		**X**	
Barnhouse		**X**	
Keeton		**X**	
Fry		**X**	
Rock Creek		**X**	
Walton Lake			**X**
Ochoco Divide			**X**
Marks Creek			**X**

Dispersed Recreation

Many Forest visitors prefer a more secluded experience than what developed campgrounds and picnic areas offer. Popular dispersed recreation activities on the Ochoco National Forest include camping, fishing, hiking, viewing wildlife, hunting, picnicking, non-commercial gathering of forest products such as antlers, mushrooms, and cones, and driving Forest roads for recreation or for viewing natural scenery. Across the Ochoco National Forest, there are over 3,036 miles of road, of which 1,388 miles are open to both highway legal and non-highway legal vehicles. In addition, there are 27 miles of trail open to motorized travel for OHVs and motorcycles. This network of roads and trails provides users with a variety of options to access and view the Forest.

Within the Lookout Mountain and Paulina Ranger Districts, there are over 900 identified dispersed sites (GIS data) of which many are accessible by high clearance roads. It is unknown how many of these sites are located within the project area; however the highest concentration of sites is around the Lookout Mountain Recreation Area, and along streams with adjacent designated roads. Big-game hunting is a very popular activity in some parts of the Forest and especially in the Ochoco Wildlife Management Unit. The 2008 NVUM (Table 27) for the Ochoco National Forest showed an estimated 19% percent of forest visitors participated in hunting as either a secondary or a primary activity. There are many dispersed sites on the Paulina Ranger District and around Lookout Mountain Recreation Area that are heavily used during hunting season.

Designated Recreation Areas and Trails

The Lookout Mountain Recreation Area is a roadless area managed to provide big game habitat and semi-primitive recreational opportunities within a natural setting. There are 22.75 miles of standard/terra trails open to non-motorized uses, including mountain bikes. The 14,365-acre area provides a wide range of recreational opportunities, including motorized access on one designated road, which is 1.3 miles long and is open to OHV use (USDA, 1989). Motorized use within this management area is restricted to designated routes.

The Deep Creek Recreation Area encompasses roughly 900 acres and is popular year-round for fishing, dispersed camping, hunting, and sightseeing. The management emphasis for this area is to provide a natural setting for recreation pursuits within the area where management activities are not visually evident (USDA, 1989). Motorized use within this management area is restricted to designated routes.

The Bandit Springs Recreation Area is adjacent to the planning area along the northeast side near US Highway 26. The management emphasis for this area is to provide dispersed, non-motorized recreational opportunities within a setting where most management activities are generally not evident to the casual observer.

Portions of the ***Summit National Historic Trail*** lie within the project area. The management emphasis for this area is to protect the integrity of the Summit Trail; to enhance and interpret significant segments for public enjoyment and education. Pristine segments will be managed to protect, interpret, and preserve their historic qualities (USDA, 1989). Motorized use within this management area is restricted to designated routes.

The 9.0 mile ***Round Mountain National Recreation Trail*** is located within the planning area. The trail is open to non-motorized uses. The management emphasis for the trail is to protect and manage for scenic qualities which make the trail corridor an attractive recreational setting. Sites along the trail where management activities are in conflict with the National Recreation Trail objectives will be rehabilitated (USDA, 1989). Although the trail is managed for non-motorized use, unauthorized use of the trail by OHVs has been known to occur.

Wilderness

The 5,400-acre Bridge Creek Wilderness is within the Ochoco Summit OHV project area. Motorized and mechanized use is prohibited within designated wilderness areas.

Wild and Scenic Rivers

The North Fork Crooked Wild and Scenic River is within the project area. The 1968 Wild and Scenic Rivers Act calls for maintaining the free-flowing character of designated rivers, protecting the water quality, and protecting and enhancing their “outstandingly remarkable values.” Outstandingly remarkable values (ORVs) are values or opportunities in a river corridor that are directly related to the river and that are rare, unique or exemplary from a regional or national perspective. The ORVs for the North Fork Crooked Wild and Scenic River are vegetation and scenic resources.

The North Fork Crooked Wild and Scenic River has segments classified as Recreational and Scenic (these segments are accessible by road and may have some development along their shorelines) and one segment classified as Wild (no development is allowed along the shoreline in this segment). The Ochoco Forest Plan standards and guidelines state that OHV access off of open roads within the Wild and Scenic river corridor is restricted to designated routes only; however, some OHV use is occurring within the corridors outside of designated routes.

Special Uses

All commercial events (where an entry fee is established) on National Forest lands must be authorized by a special-use permit. For the Forest Service to authorize events, organizers must ensure the use is consistent with surrounding land uses. There are several special use events annually within the project area, including the Bandit Springs Horse Endurance Race, the Oregon Star Party, and many less formal events such as poker rides.

Motorized Recreation Opportunities

Many OHV areas and trails exist in Central Oregon; Table 32 lists the areas closest to the project area. There are roughly 700 miles of designated OHV trail opportunities for various vehicle classes, including play areas, that are located less than 50 miles from Prineville. The 8.5 mile Green Mountain OHV trail (approximately 20 miles from the project area) and Henderson Flat (on the Crooked River National Grassland) are the only designated OHV riding areas on lands managed by the Ochoco National Forest.

Table 32. Selected OHV opportunities close to the Ochoco Summit project area.

Name	Managing Agency	Location	ATV Classes	Season	Description
Green Mountain OHV Trail	Ochoco National Forest	20 miles NE of Prineville	I and III	All year	8.5 miles of easiest to more difficult trails, not open to Class II
Henderson Flat	Crooked River National Grassland	13 Miles S of Madras	I and III	Closed Dec 1 through March 31	18 miles easiest to more difficult trails, not open to Class II
East Fort Rock	Deschutes National Forest	21 miles east of Bend on US 20	I and III, Class II on Shared Use Roads Only, Groundhog Rock Crawl Pit	All year, some trails affected by Green Dot Closure in October	318 miles of easy to most difficult trails
Edison Butte	Deschutes National Forest	24 miles SW of Bend	I, II and III	Closed Dec 1 through March 31 except for Class I vehicles	25 miles of more to most difficult trails. Restricted to vehicles under 80 inches
Cline Buttes	Prineville BLM	9 miles N of Bend on Hwys 20 and 126	I, II, and III	Generally, most trails open dependent upon snow	Up to 90 miles for various class of vehicles with varied terrain
Millican/ODOT Pit Play area	Prineville BLM	27 Miles E of Bend on Hwy 20	I and III	All Year	Open play area provides challenges for all levels of experience
Rosland Pit Play Area	Prineville BLM	26 miles S of Bend at Wickiup Jct.	I and III	All year	3.5 miles of trails, a learners' loop, a beginner play area and an advanced play area

Table 32. Selected OHV opportunities close to the Ochoco Summit project area.

Name	Managing Agency	Location	ATV Classes	Season	Description
North Millican	Prineville BLM	24 miles E of Bend off Hwy 20	I, II and III	Closed Dec 1 through April 30	102 miles of easiest to most difficult trails; 24 miles open to Class II
Millican Plateau	Prineville BLM	20 miles NE of Bend on George Millican Road	I, II and III	All Year	111 miles of easiest to more difficult trails; 37 miles open to Class II
South Millican	Prineville BLM	22 miles E of Bend off Hwy 20	I, II and III	Closed Dec 1 through April 30	43 miles of easiest to more difficult trails; 11 miles open to Class II
Santiam Pass	Willamette National Forest	22 miles west of Sisters	I, II, and III	Mid-June-mid-November (snow free)	49 miles of mostly easiest to most difficult trails.
Source: Oregon Parks and Recreation Department : http://atv.prd.state.or.us/places.php.					

Approximately 700 miles of user-created OHV routes, including open and closed roads and user created trails, have been identified in the project area. For some, these user trails have provided the experience riders desire. For others, however, these trails are generally of low to moderate value because they lack flow, connectivity, and loops. In general, there is no organization to the trails and they have been developed haphazardly as riders continue to use certain routes. Within the project area the greatest amount of OHV use is currently focused around Big Summit Prairie. During hunting season, there is increased OHV activity throughout the planning area. Although the Forest Service does not have statistically valid use numbers for OHVs on the district, forest personnel have observed an increase in the number of riders and a growing network of user-created trails in this area. However, with implementation of the Deschutes and Ochoco National Forest Travel Management Plan, most user-created routes have become off-limits to motorized vehicles.

In order to put the Ochoco Summit project area in context with other OHV riding areas and opportunities in Central and Eastern Oregon, Travel Management Plans from Ochoco and adjacent Forests were reviewed, as well as riding area descriptions posted on the Oregon State Parks and Recreation and other Forest's web pages.

In Central Oregon four of ten riding areas offered some form of opportunity for operators of class II vehicles: Christmas Valley Sand Dunes (8,000 acres), Klamath Sportsman's Park (20 acres), Edison Butte (25 miles) and Millican Valley (only on open roads). In Eastern Oregon three of eleven riding areas offered some form of opportunity for class II vehicle operators: Morrow County (20 miles), Mt. Emily (30 miles) and Virtue Flat (5,000 acres). All of the remaining riding areas posted on the State Parks web sites were limited to vehicles 50" or less in width, with the exceptions of West End ATV (Sunflower) near Spray, which allows UTVs up to 65" in width, and Upper Walla Walla which is limited to class III (single track motorcycles).

In the Central Oregon Region, the six riding areas offering opportunities for class I and III vehicles (50" and less) total approximately 662 miles of designated routes. In the Eastern Oregon Region, the six riding areas offering opportunities for class I and III vehicles (50" and less) total approximately 338 miles of designated routes. In the Eastern Oregon Region, the riding area offering opportunities for class I, III and IV vehicles (65" and less) includes 3,700 acres, while the area limited to class III

(motorcycle) includes 40 miles of designated routes. Additional opportunities will soon be available following construction of trails planned under the Three Trails Off-Highway Vehicle Project on Deschutes National Forest; Cline Buttes on Prineville District BLM; and the Rock Creek and McCubbins Gulch areas under the Mt. Hood National Forest Off-Highway Vehicle (OHV) Management Plan. Fremont-Winema is currently in the process of planning the South Chiloquin Motorized Trail Project.

In addition to designated riding areas and designated trails, OHVs may also travel on open roads that have been approved for mixed use (highway legal as well as non-highway legal vehicles). On the Deschutes and Ochoco National Forests, with implementation of the Travel Management Plan, OHVs would be allowed to utilize approximately 6,700 miles of mixed use road and 1,230 acres of gravel pit areas across the two Forests. Elsewhere in Central Oregon, the Fremont-Winema National Forest offers approximately 5,900 miles of mixed use road and 165 miles of mixed use trail under their Travel Management Plan. Some of these routes are open year-round while others are subject to seasonal restrictions. Though the miles available for mixed use on open roads do not provide the same quality of recreational experience as motorized trails, they do offer opportunities for recreational experiences and motorized access for those who are not looking for technically difficult routes.

Recreation Use and Trends

Assumptions and Methodology for Estimates

The 2008 NVUM for the Ochoco National Forest estimated that there were approximately 247,000 recreation visits to the forest each year (USDA Forest Service 2009c). Table 27 shows the activities in which people participated during their visits to the Ochoco National Forest. By using this survey data, and trends in the number of people participating in recreational activities (NSRE data) from Table 33, it is predicted that in the next 10 years, the activities with the greatest growth (in terms of total participants multiplied by percent change) would be wildlife/birds, general relaxing, viewing other features, hiking/walking, fishing and driving for pleasure. The activities with the least growth are predicted to be backpacking, cross-country skiing, snowmobiling, horseback riding, and other motorized activity (USDA Forest Service 2005).

Table 33. Trends in number of people participating and number of participation days for selected outdoor recreation activities in the United States, 1999-2008.

Activity	Total U.S. Participants (1,000s), 2005-2008	Percent Change in Participants, 1999-2001 to 2005-2008	Total Annual Participant Days (millions), 2005-2008	Percent change in Total Days 1999-2001 to 2005-2008
Developed Camping	52,021	2.7	532.3	9.3
Primitive Camping	33,330.2	-2.0	310.4	12.1
Backpacking	22,077.0	-0.6	277.7	24.0
Picnicking	115,836.2	-1.4	779.7	-17.2
Viewing Natural Scenery	145,489.2	14.1	11,482.3	60.5
Visiting Historic Sites	92,920.8	-4.5	590.8	-15.2
Nature Center Activities	127,406.5	5.0	1,044.0	23.2
Drive Off-road	44,231.3	18.6	1,349.6	56.1
Driving for Pleasure	111,069.0	3.1	2,637.3	-1.1
Snowmobiling	8,328.2	-29.7	92.7	-27.4
Day Hiking	74,032.5	6.8	1,993.4	-20.9
Horseback Riding (trail)	15,262.6	-8.2	278.3	-35.2
Bicycling	91,225.5	7.7	-	-
Kayaking	12,480.5	63.1	76.1	29.4
Downhill Skiing	15,615.4	-14.8	126.4	-15.7
Cross-country Skiing	4,970.7	-39.2	58.8	-7.8

Table 33. Trends in number of people participating and number of participation days for selected outdoor recreation activities in the United States, 1999-2008.

Activity	Total U.S. Participants (1,000s), 2005-2008	Percent Change in Participants, 1999-2001 to 2005-2008	Total Annual Participant Days (millions), 2005-2008	Percent change in Total Days 1999-2001 to 2005-2008
Gathering Forest Products	71,023.3	16.1	869.3	1.9
View or Photograph Birds	81,119.9	19.3	8,039.0	37.6
Viewing Other Wildlife	114,792.0	21.3	5,341.6	46.9
Mountain Climbing	11,811.2	-12.5	104.1	20.5
Visit a Wilderness	70,591.9	3.0	1,108.6	12.8
Excerpted from Cordell et al. 2008b. Source: NSRE 1999-2001 and 2005-2008. Missing data indicate that either participation or annual days were not collected during that time period.				

Population is the major influence in recreation growth in the United States (Cordell 2004). If the population of the market zone increases (where the majority of visitors come from), the recreation use increases. It is highly likely that the population would grow in counties where visitors to Central Oregon live, resulting in increased recreation use of the Ochoco National Forest.

NVUM found that for the Ochoco National Forest, fifty-seven percent of the forest visitors come from Deschutes, Crook and Jefferson Counties. In predicting future recreation growth, it is important to look at population predictions in these three counties.

Predicted OHV use in the Ochoco Summit OHV Planning Area

Most OHV use in the project area occurs seasonally as the higher elevations become inaccessible due to snow. Based on observational data from Forest Service staff, the heaviest use within the Ochoco Summit project area occurs on summer weekends and holidays from approximately May 1 – Sept. 30, with less recreational use occurring weekdays and during the shoulder seasons of October and November. An exception to this is during hunting season. Starting with bow hunting in August and continuing through November, there are hunting camps scattered across the area. During this time, there is increased use of OHVs primarily for hunting purposes.

In the short term, fuel prices and the recession are affecting OHV recreation (Albright 2008); however, less than half of OHV survey respondents in 2005 said that “lack of money” was an important reason for not participating in their motorized activities more than they do (Bergeson et al. 2005). Rather than abandon the sport altogether, OHV enthusiasts are predicted to recreate closer to home. For Central Oregon residents, the Ochoco National Forest is substantially closer to home than Portland, the Willamette Valley, or the coastal dunes.

As the recession abates, it is likely that Oregon counties would recover economically and continue growing. This continued population growth would likely result in increased recreation use of National Forests. Overall demand for OHV riding opportunities on the Ochoco National Forest is expected to increase in the long term (Cordell et al. 2008b; Bergeson et al. 2005).

Based on estimates from the NVUM survey on the Ochoco National Forest, more than 14,000 forest visitors participated in OHV or Motorized Trail Activities on the Forest in 2008. For the purpose of this analysis, it is assumed that there are approximately 5,000 visitors participating in OHV use within the project area (slightly more than 1/3 of the estimated total forest OHV participation).

Oregon Statewide Comprehensive Outdoor Recreation Plan (SCORP) data indicated a 38 percent increase for ATVs between 1987-2002 (2.5 percent annual increase) and Cordell’s 2008 data indicated a 56.1 percent increase over the past decade (5.6 percent annual increase); based on these

data[4], the rate of increase of ATV use on the Ochoco National forest is predicted to be between 2.5 and 5.6 percent per year over the next decade. This would translate to about 125-280 new riders within the project area each year.

Assumptions for the Effects Analysis

This recreation analysis is based on the following assumptions:

- OHV users base their destination decisions on a number of variables that include weather-related trail conditions, desire for variety within a given riding season, time and money they can devote to traveling to a riding area, and their choice of riding partners.
- Weather conditions preclude use in the Ochoco Summit OHV area much of the year, which reduces the overall opportunity.
- Once the Travel Management Rule is fully implemented, there would be no other places to ride other than existing designated trail systems or mixed use roads, and those trail systems that are in place would likely increase in visitation over existing levels.
- If a new trail system is created in the project area, the estimated OHV use and annual increase described in the previous section would be focused within that trail system.
- Participation on a new OHV trail system initially would be at the lower end of the estimate of use as trail construction is phased in (incremental improvements over a number of seasons do not usually trigger a large sustained surge in use).
- The downward trend over the last couple of years would not likely continue as the economy becomes stronger and riders become used to a State of Oregon requirement for training of young OHV riders.
- Research shows that OHV riders are willing to travel more than 100 miles (Bergeson et al. 2005).
- A well-designed designated trail system with adequate facilities would attract riders.
- Word of mouth of a well-designed and managed trail system would contribute to the visitation.
- A trail system that uses Oregon ATV grant monies would be included on the State web site and brochure; when a new trail system is advertised, people from around the state would be likely to visit the area.
- If riders like the trail system, they would return.

Evaluation Criteria

The Experience of the OHV Recreationists

A successful OHV route system provides sufficient traveling distance, play areas, and scenic views, as well as a variety of “difficulty” levels to accommodate all types of users. A successful system also has adequate trailhead and staging area facilities, which include parking, restrooms, drinking water, and picnic or camping opportunities. Many OHV riders want to recreate in a dispersed setting where they feel some level of solitude (Crimmins 2006).

[4] 2003-2007 Oregon Statewide Comprehensive Outdoor Recreation Plan (especially Chapter 4 on Outdoor Recreation); Cordell, 2008 (The Latest on Trends in Nature-based Outdoor Recreation Activity); Cordell et al. 2008 (Outdoor Recreation Activity Trends: What’s Growing, What’s Slowing? [A Recreation Research Report in IRIS Series, September 2008]); Cordell et al. 2008 (Off-Highway Vehicle Recreation in United States and its Regions and States: An Update National Report from the National Survey on Recreation and the Environment).

When trail systems are insufficient, there may be an increased tendency for riders to create new trails, which can lead to difficulty in enforcement of rules and regulations.

The effects of the alternatives on the OHV recreation experience have been evaluated using the following criteria:

1) Travelling Distance

The alternatives were evaluated by measuring and comparing the number of miles of connected OHV trails by each vehicle class. A qualitative descriptor (high, moderate or low value) was assigned to a range of contiguous route miles to describe the adequacy of an experience based solely on the sufficiency of miles, based on Crimmins (2006). Table 34 summarizes this information by vehicle class.

Table 34. Value of OHV experience by vehicle class based on miles of trail.

Miles of Class I ATV Trail (e.g. quad, 4-wheeler)	Value
41 to 80	High Value
16 to 40	Moderate Value
0 to 15	Low Value
Miles of Class II ATV Trail (e.g. Jeep, side-by-side)	**Value**
26 to 50	High Value
11 to 25	Moderate Value
0 to 10	Low Value
Miles of Class III Trail (e.g. Motorcycle)	**Value**
51 to 100	High Value
26 to 50	Moderate Value
0 to 25	Low Value

2) Play Areas and Scenic Views

Play areas and small, confined, open areas (such as mineral sources or pits) where use is not limited to trails, often provide OHV riders the opportunity to find challenge in an appropriate manner, to warm up their equipment and for new or inexperienced riders to learn and practice skills prior to a trail ride. Although not limited solely to OHV riders, scenic viewpoints such as vistas, historic sites, and geologic features are desired destinations. The presence or absence of view and play areas affects a rider's experience.

Alternatives were evaluated by comparing the number of play areas and scenic viewpoints in each alternative, and assigning the number a value: low, medium, or high (Crimmins 2006). These values are summarized in Table 35.

Table 35. Value of an OHV Area Based on Play Areas and Scenic View Points.

Play Areas		Scenic Viewpoints	
Number	Value	Number	Value
0-1	Low	0-1	Low
2-3	Moderate	2-3	Moderate
4+	High	4+	High

3) Staging and Camping Areas

A desirable trail system would have at least one developed staging area (fully-developed or semi-developed staging area or a camping area) in which they could camp. The alternatives were evaluated on whether or not they contain developed staging areas. Refer to Table 36 for a description of amenities that would be provided at staging areas based on level of development.

Table 36. Description of Staging and Camping Areas.

Amenities	Fully developed (3-5 acres)	Semi-developed (2-3 acres)	Semi-primitive (1-2 acres)
Campsites	X		
Parking area	X	X	X
Toilets	X	X	
Tot lot or Learner loop*	X		
Young Teen area/warm-up loop**	X		
Picnic tables	X	X	
Fire rings	X	X	

* Tot lot- small riding area for young children where they are under constant parental supervision, for class I and III vehicle staging areas only

** Area where young teens can learn to ride and for short warm-up rides

4) Motorized User Conflicts

OHV users are a diverse group with varying desires and expectations. Not all vehicle classes perform the same on any given terrain or trail layout (Crimmins 2006). User separation can enhance specific rider experiences. On the other hand, providing separate trails for different vehicle classes can be expensive, cause resentment, be difficult to enforce, and limit opportunities for communication and cooperation (FHWA 1994).

The separation of classes of vehicles was a particular concern expressed by some ATV and motorcycle riders at meetings with Forest Representatives and during the scoping period. Some motorcycle enthusiasts want only single-track trails (6 - 24 inches wide). Maintaining trails for this experience means excluding ATVs. On the other hand, it is common for a family or group of friends to visit the Forest with more than one vehicle class in tow. Such a group usually would prefer routes open to more than one vehicle class.

5) Trail Complexity

Comments made during the scoping period and public meetings indicate that OHV riders wish to feel challenged engaged and inspired. However, what presents a challenge to one rider may be too easy for another and too challenging to a third. It's logical to assume that the longer the trail system, the better it can accommodate a variety of user demands. However, a trail system that's largely made up of user-created trails and National Forest System roads may not provide the range of experiences that OHV riders are looking for.

Forest Service personnel have heard from recreational motorized users through scoping comments and public meetings that the number a trail loop opportunities available within five miles of a staging area and the number of decision points add to the desirability of the trail system.

Analysis of user experience-based experience based on trail complexity will be largely qualitative, but will include the number of miles of Forest road converted to trail as an indicator of improved trail quality.

Rider experience will also be described based on the number of decision points at trail crossings and at junctions with mixed use roads along the trail system, and the number of trail miles and loop opportunities within five miles of a staging area.

The following data compare each alternative's trail system features including new trail construction, conversion of road to trails, and utilizing open roads as connectors, broken out by vehicle class for which the trail systems are proposed.

Alternative 1:

Miles of designated motorized trails: 0
Total miles of open mixed use roads (based on draft MVUM): 674 miles

Alternative 2: Proposed Action

Length of class I system : 69 miles
Length of 50" wide trail – new route : 31 miles
Length of 50" wide trail – closed road: 21 miles
Length of 50" wide trail – decom road: 3 mile
Class I system on open road: 14 mile

Length of class II system : 49 miles
Length of 80" wide trail – new route : 12 miles
Length of 80" wide trail – closed road: 7 miles
Length of 80" wide trail – decom road: 1 mile
Class II system on open road: 28 mile

Length of class III system : 52 miles
Length of 24" wide trail – new route : 26 miles
Length of 24" wide trail – closed road: 16 miles
Length of 24" wide trail – decom road: 7 mile
Class III system on open road: 4 mile

Overall Alternative designated route mileage: 170 miles of which 46 miles are on open roads (124 miles of trail on new routes or road-to-trail conversion)

Alternative 3:

Length of class I system : 38 miles
Length of 50" wide trail – new route : 22 miles
Length of 50" wide trail – closed road: 11 miles
Length of 50" wide trail – decom road: 1 mile
Class I system on open road: 4 mile

Length of class II system : 0 miles

Length of class III system : 62 miles
Length of 24" wide trail – new route : 28 miles
Length of 24" wide trail – closed road: 19 miles
Length of 24" wide trail – decom road: 6 mile
Class III system on open road: 9 mile

Overall Alternative mileage: 101 of which 13 miles are on open roads (88 miles of trail on new routes or road-to-trail conversion)

Alternative 4:

Length of class I system : 129 miles
Length of 50" wide trail – new route : 48 miles
Length of 50" wide trail – closed road: 39 miles
Length of 50" wide trail – decom road: 8 mile
Class I system on open road: 34 mile

Class II system on open road: 30 mile
Length of 80" wide trail – new route : 11 miles
Length of 80" wide trail – closed road: 6 miles
Length of 80" wide trail – decom road: 1 mile
Class II system on open road: 11 mile

Length of class III system : 52 miles
Length of 24" wide trail – new route : 22 miles
Length of 24" wide trail – closed road: 17 miles
Length of 24" wide trail – decom road: 5 mile
Class III system on open road: 8 mile

Overall Alternative mileage: 211 of which 53 miles are on open roads (158 miles of trail on new routes or road-to-trail conversion)

The Experience of Non-motorized Recreationists

Non-motorized or quiet recreation is a popular activity within the planning area. "Quiet" recreationists include hikers, bicyclists, equestrians, bird watchers, hunters, anglers and others for whom the quality of their experience depends to a large degree upon their ability to escape the sights and sounds of an increasingly mechanized society. There are roughly 132 miles of forest system trails on the Ochoco National Forest and about 53 miles within the Ochoco Summit OHV Planning area that are managed exclusively for non-motorized uses (excluding winter snowmobile, cross-country ski and snowshoe trails). The 27 miles of forest trails on the Ochoco National Forest that are managed for OHV uses (including 8.5 miles on the Lookout Mountain Ranger District) are also open to non-motorized uses.

A growing body of research demonstrates that traditional and quiet recreationists are adversely affected by OHV use and often seek out landscapes free from OHVs. With respect to shared use of trails, a recent analysis concluded that, "even though trails are designated as multiple use, heavy motorized use tends to cause other trail users to pursue opportunities at other locations in order to realize desired experiences and benefits," (BLM, 2004). This displacement effect has prompted some researchers to claim that, "the displacement of…non-motorized recreation in favor of more intensive OHV use may have significant economic impacts on the local economy," (Swanson and Loomis, 1996).

The sound analysis for this project was performed using geographic information systems (GIS) modeling software developed by Sarah Reed for the Wilderness Society in Berkley, California. The modeling software, called SPreAD-GIS, is a GIS adaptation of a long hand analysis technique developed previously by the Forest Service and the Environmental Protection Agency. It is a series of commands that are run within Environmental Systems Research Institute (ESRI) ArcMap software. The series of SPreAD-GIS commands or scripts attempt to create concentric zones of diminishing sound around a point or along a trail or road to measure the radiating effects of motor noise in forested and other natural ecosystems. In summary, the model uses elevation, vegetation, sound source, model extent, motor type, weather conditions, predominant vegetation type (coniferous forest) and ambient sound conditions to produce a raster dataset that approximates sound diffusion through the landscape from a linear sound source.

Using the SPreAD-GIS scripts, a motorcycle was selected as the motor type and sound source as it had the potential for producing the highest dB level based on the model. The proposed OHV trail system was buffered with a 45 dB noiseband from each OHV trail and shared-use road for each alternative. This information was then overlaid over the project area to determine how many acres were within the 45 dB noiseband of a proposed OHV trail or shared-use road by alternative. The

buffered layer within the 45 dB noiseband is the area determined to be the minimum distance where OHVs would be clearly audible over expected normal ambient noise.

A designated OHV trail system would consist of both concentrations of segments of OHV trails and connecting shared-use roads. It is assumed that OHVs would spend more time on the trails (because trails are a preferable opportunity) and use the shared-used roads only to traverse to another trail area. It is acknowledged that OHVs are not the only audible sounds within the Ochoco Summit OHV project area as there are mixed use roads that produce associated noise that would continue regardless of this decision.

Since there are many destinations where both those enjoying motorized and quiet recreation prefer, the potential OHV trail system was buffered at the 45 dB noiseband from each OHV trail and shared-use road for each alternative and overlaid with a map of developed sites, non-motorized trails, known areas of dispersed campsites, and the Horse Endurance race event routes. Acreage of these sites within the 45 dB noiseband of an OHV trail or shared-use road was then determined. The intersection of these layers should be the area where OHVs can be heard from those specific sites.

User Conflicts

User conflict happens when a person's expectations for his or her recreational experience are not met due to contact with another user or through disturbance from the sound or physical evidence left by another user. The potential for conflict exists among all user groups, and even within a user group, when personal expectations of desired experience are not met. Not all user conflicts on the National Forest are entirely recreation-based; the National Forest System provides a wide array of resource-based opportunities such as timber harvest, livestock grazing and mining.

Non-motorized users who use designated motor vehicle routes should expect to encounter motor vehicle use, so such use would not as likely affect their expectation and experience. When a non-motorized user encounters motor vehicles (or evidence of motor vehicles, such as noise or emissions) in an area where he or she does not expect to, user conflict is more likely to occur. Equestrians may be more sensitive to encounters with other users due to safety.

The Ochoco National Forest (ONF) separates its trails between Winter/Summer and Motorized/Non-motorized. There are a few exceptions where sub categorical separations occur such as "Hikers Only" trails within a Summer/Non-Motorized trail. User group conflicts are most likely to occur when trails share a variety of trail uses. Trails on the Ochoco historically have not been designed to separate user types. Separation of user types requires more management and funding than trails on which uses are not separated.

Motorized OHV trails on the ONF also receive use from non-motorized recreationists such as equestrians, hikers and mountain bikers. Though noise is a factor that can detract from those seeking non-motorized use, people using trails that expect motorized encounters are able to use noise to their advantage. Non-motorized users are able to hear motorized vehicles and avoid encounters; motorized users often cannot anticipate encounters with other users unless line-of-sight is available. Due to trail use hierarchy and implementation of the Travel Management Visitor Use Map (MVUM) in 2011, a trail encounter of motorized use on non-motorized trails is expected to be less likely. In addition to trail encounters, trail design and tread characteristics play a role in the user experience and concern for these characteristics may affect the perceived conflict between user groups.

Environmental Effects

Areas within the Ochoco Summit Project Area Not Affected by the Action Alternatives

Developed Recreation and Forest System Trails: There would be no affect from any of the action alternatives to the following developed recreation sites and trails: Walton Lake CG, Biggs Spring

CG, Big Spring CG, Deep Creek CG, Cottonwood CG, Wolf Creek CG, Sugar Creek CG, Barnhouse CG, Wildwood CG, Walton Lake Trail, Lookout Mountain Recreation Area Trail Systems, Round Mountain National Recreation Trail, Ochoco Mt.Trail, Barnhouse Trail, Cold Springs Rental Cabin, Crystal Springs Organization Camp, Marks Creek Sledding Hill.

Congressionally Designated Areas: The 5,400 acre Bridge Creek Wilderness is within the boundary of the Ochoco Summit OHV planning area; however, the closest point to any proposed motorized OHV trail is over one mile. No portion of the wilderness area is within the noiseband >45 db. Motorized and mechanized uses are not allowed within designated wilderness, so most visitors to wildernesses expect quiet, but all wildernesses have transition zones where motorized sounds can be heard. In addition, motorized aircraft routinely fly over wilderness, so visitors most likely hear these sounds.

The North Fork Wild and Scenic River corridor is within the boundary of the Ochoco Summit OHV planning area; however, the closest point to any proposed motorized OHV trail is more than 2.2 miles. No portion of the Wild and Scenic River corridor is within the noiseband >45 db. Motorized travel is allowed only on designated routes within the Wild and Scenic River Corridors, and OHV travel could occur on any designated roads within the corridor that are open to mixed use. There are 659 miles of mixed use road open to OHVs within the corridor.

Lookout Mountain Recreation Area: There would be no affect from any of the action alternatives on any area within the Lookout Mountain Recreation Area. The closest proposed motorized trails are > 4 miles from the boundary of this area. OHV use would be allowed on any road open to non-highway legal vehicles that are within or adjacent to the Recreation area. There are 1.3 miles of road currently open to non-highway legal OHV use adjacent to or within the Lookout Mountain Recreation Area.

Non Motorized Trails: There are 50 miles of trails managed exclusively for non-motorized use within the project area, but none of the trails are within the > 45db noiseband (except for a maximum of 0.03 miles of Keeton Trail).

Non-Motorized Winter Recreation Use: Non-motorized winter recreation is high in the area of Ochoco Divide and Walton Sno-Parks and generally consists of cross-country skiing and snowshoeing. This analysis focuses on summer OHV use and does not analyze effects to winter recreation opportunities.

Motorized Recreation Experience

Table 37 displays the number of miles of OHV trail by alternative. The table distinguishes between new trail construction and/or roads converted to trails (trail miles) from the trail system (including connecting roads) in the action alternatives. Routes were mapped using information obtained by the users themselves, agency personnel who specialize in motorized recreation, and Geographical Information Systems terrain data. Values displayed in Table 37 are based on trail system length only.

Table 37. Miles of OHV trail and assigned value by vehicle class by alternative.

Summary of Alt 2 - Proposed Action motorized trails and areas.				
Trail Type	**Total Trail System miles (including open road connections)**	**Value**	**Trail Miles (new construction or road-to-trail conversion)**	**Value**
Motorcycle (<24”) Trail	52	H	49	M
ATV (vehicles <50”) Trail	69	H	55	H
4x4 (vehicles <80”) Trail	49	H	20	M
Total	**170**		**124**	

Summary of Alt 3 - Proposed Action motorized trails and areas.				
Trail Type	**Total Trail System miles (inc. open road connections)**	**Value**	**Trail Miles (new constr. or Rd to Trail conversion)**	**Value**
Motorcycle (<24”) Trail	62	H	53	H
ATV (vehicles <50”) Trail	38	M	34	M
4x4 (vehicles <80”) Trail	0	N/A	0	N/A
Total	**100**		**87**	

Summary of Alt 4 - Proposed Action motorized trails and areas.				
Trail Type	**Total Trail System miles (inc. open road connections)**	**Value**	**Trail Miles (new constr. or Rd to Trail conversion)**	**Value**
Motorcycle (<24”) Trail	52	H	44	M
ATV (vehicles <50”) Trail	129	H	95	H
4x4 (vehicles <80”) Trail	30	M	18	M
Total	**211**		**157**	

Table 38 summarizes the riding areas by type, and scenic viewpoints that would be accessible to OHVs with connection to proposed trail systems in each alternative.

Table 38. Riding areas and scenic viewpoints by alternative.

	Alt 2	Alt 3	Alt 4
Ochoco Divide Sno-Park	W/L	W/L	W/L
Ahalt Mineral Source	PA	_	PA
Walton Snopark	TA	TA	TA
Scott's Mineral Source	W/L	_	W/L
Aspen Mineral Source	PA	_	W/L*
Road 600	W/L	_	W/L
Peterson Lava	RC	_	RC
Ross/Peterson Ridge	TA	_	TA
Cottonwood Pit	W/L	W/L	W/L
Six Corners Mineral Source	W/L	W/L	W/L
Mt. Pisgah viewpoint	yes	no	yes
Peterson Pt. viewpoint	no	no	yes
Slide Mtn viewpoint	no	no	yes
Value based on play areas alone	mod	low	low
Value base on veiwpoints alone	high	low	high

* Changes location to Happy Camp Crk Ridge
W/L – Warm-up and learner loop
TA – Trail access
RC – Rock crawl
PA – Play area for ATV/MC

Table 39 summarizes the staging areas and mapped trailheads by alternative; Table 40 provides site-specific information about each staging area.

Table 39. Staging areas and trailheads by alternative.

Alternative		Staging Areas	Mapped Trail Heads
2	Class I/III	6	3
	Class III only	2	0
	Class II	2	3
	TOTAL	**10**	**6**
3	Class I/III	2	0
	Class III only	2	0
	Class II	0	0
	TOTAL	**4**	**0**
4	Class I/III	6	0
	Class III only	2	0
	Class II	2	0
	TOTAL	**10**	**0**

Table 40. Site-specific staging area information by alternative.

	Alt 2	Alt 3	Alt 4
Ochoco Divide Sno-Park (SD)	X	X	X
Ahalt Mineral Source (FD)	X		X
Walton Snopark (SD)	X	X	X
Scott's Mineral Source (SD)	X		X
Aspen Mineral Source (FD)	X		X*
Road 600 (SD)	X		X
Peterson Lava (FD)	X		
Ross/Peterson Ridge (SD)	X		
Cottonwood Pit (FD)	X	X	
Six Corners Mineral Source (FD)	X	X	
# Trailheads (SP)	6	0	0
* Changes location to Happy Camp Crk Ridge SD-Semi-developed SP-Semi-primitive FD-Fully developed			

Trail complexity was estimated as contributing to rider experience based on the number of decision points within the trail system and connecting mixed use roads, and the number of trail miles and loop opportunities within 5 miles of a staging area. These comparisons are displayed in Table 41. In this table trail to trail decision points are the number of locations where the trail system connects to more than one segment of the trail system. Trail to road decision points are where the trail system connects to mixed use roads that are not part of the designated trail system.

Table 41. Decision points and opportunities near staging areas by alternative.

	Alt 2	Alt 3	Alt 4
Trail to Trail Decision Points, Class I	27	21	73
Trail to Trail Decision Points, Class II	29	0	11
Trail to Trail Decision Points, Class III to Class III	22	3	15
Trail to Trail Decision Points, Class III to Class I/II/III	78	24	99
Trail to Road Decision Points, Class I	64	34	94
Trail to Road Decision Points, Class II	36	0	33
Trail to Road Decision Points, Class III	28	49	28
System Miles w/in 5 mi. of Staging Area, Class I opportunity	69	38	133
System Miles w/in 5 mi. of Staging Area, Class III opportunity	69	64	85
Number of Loops within 5 miles of Staging Areas, Class I	5	10	27

Alternative 1

Under Alternative 1, motorized use of designated routes in the project area would continue to be allowed in locations described on the MVUM map. Within the acres that are open to cross country travel off designated routes, new user created routes would likely continue to be created, and use of existing user created trails would continue. Motorized use would continue and likely increase on

closed roads as more roads are administratively closed or decommissioned. Use of user created routes would continue to be shared between different classes of vehicles.

Alternative 1 would allow access to all areas open to cross country travel associated with pits for mineral extraction and all viewpoints that can be accessed on roads open to non-highway legal vehicles as per the MVUM. Within the analysis area these include Crystal, Ahalt, Walton, Scott's Camp, Aspen, Six Corners, Remington, Thornton, Grasshopper, Juniper, and Flow Top.

Although the amount of user created trail miles is not known, it is anticipated that Alternative 1 would retain the current condition of user-created and unauthorized routes as no closures or rehabilitation of such routes are proposed under this alternative. The existing condition lacks cohesion and order. While some users have expressed satisfaction with the existing undesignated trails, other users find it to be disorienting and hazardous. Because the existing trails were created by users, in many cases they were not designed to be safe and sustainable. Recreation management and law enforcement within a user-created trail system are extremely difficult. The potential for user conflicts (among motorized users and between motorized and non-motorized recreationists) could remain high under Alternative 1 in areas with existing unmanaged motorized recreation.

This alternative would not provide any organized facilities designed specifically for parking, camping, and dispersal into a nearby trail system. It is assumed riders would continue to use the areas they have in the past. Areas such as Walton Lake Snow Park would continue to be used for day and overnight use, and riders would continue to utilize material sources and other dispersed areas that provide for parking and access to desired riding areas.

Alternative 2

Alternative 2 would provide a total of 170 miles of designated motorized trail for Class I, II, and III vehicles (including 46 miles of connecting open roads). See Table 42 for trail miles broken out by vehicle class.

Table 42. Summary of trail miles proposed in Alternative 2 of the Ochoco Summit OHV Trail System project.

Vehicle Class	Miles of Open Road within Designated Trail System	Miles of Closed Road used for Trail	Miles of Decommissioned Road Converted to Trail	Trail Constructed on Other Than National Forest System Roads (may include user-created trail)	Total Trail Miles
I	14	21	3	31	69
II	28	7	1	12	48
III	4	16	7	26	53
TOTALS	**46**	**44**	**11**	**69**	**170**

General Effects for All Motorized Users

Because the designated Class I and Class III systems would exclude Class II vehicles, risk of conflicts between Class II vehicles and smaller vehicles would be reduced; however, risk would still be present on mixed-use roads. This separation of use would improve safety over the current condition.

Alternative 2 is rated as "Moderate" for presence of play areas and "High" for access to scenic views (see Table 35). Staging areas would provide opportunities for camping as well as day use (see descriptions in Chapter 2 of this EIS); Alternative 2 would provide ten staging areas as well as six mapped trailheads (see Table 39).

Class I

Alternative 2 would allow for up to 55 miles of 50”-wide trail for Class I vehicles plus 14 miles of open mixed-use road within the designated trail system. These 55 miles would be available for use by motorcycles but would be closed to Class II vehicles. This alternative would provide six staging areas and three trailheads specifically intended for use by ATVs (but available to any trail users). Staging areas would accommodate day use and overnight camping, and most would include a warm-up or learner’s loop.

Class II

Alternative 2 would allow for up to 20 miles of 80”-wide trail for Class II vehicles plus 28 miles of open mixed-use road within the designated trail system. These 20 miles would be available for use by all classes of vehicle. This alternative would provide two staging areas and three mapped trailheads specifically intended for use by Class II vehicles (but available to any trail users). Staging areas would accommodate day use and overnight camping.

Class III

Alternative 2 would allow for up to 49 miles of 24”-wide trail for Class III vehicles plus 4 miles of open mixed use road within the designated trail system. These 49 miles would be available for use by motorcycles only. This alternative would provide two staging areas intended for use by motorcycles.

Alternative 3

Alternative 3 would provide a total of 100 miles of designated motorized trail for Class I and III vehicles (including 13 miles of connecting open roads). See Table 43 for trail miles broken out by vehicle class.

Table 43. Summary of trail miles proposed in Alternative 3 of the Ochoco Summit OHV Trail System project.

Vehicle Class	Miles of Open Road within Designated Trail System	Miles of Closed Road used for Trail	Miles of Decommissioned Road used for Trail	Trail Constructed on Other Than National Forest System Roads (may include user-created trail)	Total Trail Miles
I	4	11	1	22	38
II	0	0	0	0	0
III	9	19	6	28	62
TOTALS	**13**	**30**	**7**	**50**	**100**

General Effects for All Motorized Users

Because the designated Class I and Class III systems would exclude Class II vehicles, risk of conflicts between Class II vehicles and smaller vehicles would be reduced; however, risk would still be present on mixed-use roads. This separation of use would improve safety over the current condition.

Alternative 3 is rated as “Low” for presence of play areas and “Low” for access to scenic views (see Table 38). Staging areas would provide opportunities for camping as well as day use (see descriptions in Chapter 2 of this EIS); Alternative 3 would provide four staging areas and no mapped trailheads (see Table 39).

Class I

Alternative 3 would allow for up to 34 miles of 50”-wide trail for Class I vehicles plus 4 miles of open mixed-use road within the designated trail system. These 34 miles would be available for use by motorcycles but would be closed to Class II vehicles. This alternative would provide two staging

areas specifically intended for use by ATVs (but available to any trail users). Staging areas would accommodate day use and overnight camping, and most would include a warm-up or learner's loop.

Class II

Alternative 3 would not provide a designated trail system for Class II vehicles.

Class III

Alternative 3 would allow for up to 53 miles of 24"-wide trail for Class III vehicles plus 9 miles of open mixed use road within the designated trail system. These 53 miles would be available for use by motorcycles only. This alternative would provide two staging areas intended for use by motorcycles.

Alternative 4

Alternative 4 would provide a total of 209 miles of designated motorized trail for Class I, II, and III vehicles (including 53 miles of connecting open roads). See Table 44 for trail miles broken out by vehicle class.

Table 44. Summary of trail miles proposed in Alternative 4 of the Ochoco Summit OHV Trail System project.

Vehicle Class	Miles of Open Road within Designated Trail System	Miles of Closed Road used for Trail	Miles of Decommissioned Road used for Trail	Trail Constructed on Other Than National Forest System Roads (may include user-created trail)	Total Trail Miles
I	34	38	5	51	128
II	11	6	1	11	29
III	8	17	5	22	52
TOTALS	**53**	**61**	**11**	**84**	**209**

General Effects for All Motorized Users

Because the designated Class I and Class III systems would exclude Class II vehicles, risk of conflicts between Class II vehicles and smaller vehicles would be reduced; however, risk would still be present on mixed-use roads. This separation of use would improve safety over the current condition.

Alternative 4 is rated as "Low" for presence of play areas and "High" for access to scenic views (see Table 35). Staging areas would provide opportunities for camping as well as day use (see descriptions in Chapter 2 of this EIS); Alternative 4 would provide ten staging areas and no mapped trailheads (see Table 39).

Class I

Alternative 4 would allow for up to 94 miles of 50"-wide trail for Class I vehicles plus 34 miles of open mixed-use road within the designated trail system. These 94 miles would be available for use by motorcycles but would be closed to Class II vehicles. This alternative would provide two staging areas specifically intended for use by ATVs (but available to any trail users). Staging areas would accommodate day use and overnight camping, and most would include a warm-up or learner's loop.

Class II

Alternative 4 would allow for up to 18 miles of 80"-wide trail for Class II vehicles plus 11 miles of open mixed-use road within the designated trail system. These 18 miles would be available for use by all classes of vehicle. This alternative would provide two staging areas specifically intended for use by Class II vehicles (but available to any trail users). Staging areas would accommodate day use and overnight camping.

Class III

Alternative 4 would allow for up to 44 miles of 24”-wide trail for Class III vehicles plus 8 miles of open mixed use road within the designated trail system. These 44 miles would be available for use by motorcycles only. This alternative would provide two staging areas intended for use by motorcycles.

Non-Motorized Recreation Experience

Oregon State law and the Forest Service require that OHVs be no louder than 99 dB at 20 inches from the exhaust opening. Some untested individual OHVs currently using the Lookout Mountain Ranger District may be louder than 99 dB. If implemented, an action alternative may provide more active management of OHV use and consequently more effective monitoring and enforcement. If this is achieved, overall sound levels may decrease over the existing condition. Monitoring and testing could be more efficient at identified staging areas and allow law enforcement and volunteers a better opportunity to test for compliance at key locations and times. Vehicles that are tested and found to be over the 99 dB sound threshold would not be able to operate on public land.

A study of the potential impacts of aircraft overflights of wilderness areas found a majority of wilderness visitors were not annoyed by overflight sounds, a minority (16 percent) were somewhat annoyed, and a smaller minority (4 percent) were highly annoyed. This same study reported that the three most often mentioned reasons for visiting wilderness were experiencing peace and quiet (89 percent of respondents); viewing scenic vistas without hearing sounds of civilization (87 percent); and hearing the sounds of nature (81percent). Even though some visitors were annoyed, aircraft sounds did not appreciably impair these wilderness users overall enjoyment of their visits to the wilderness nor reduce their likelihood of repeat visits (Harrison et al. 1992). It is likely, as with wilderness visitors, that some visitors would be annoyed by OHV sound and some would not.

Sound dissipates over distance. If the effects of terrain, vegetation and wind are excluded, sound intensity decreases about 6 decibels (dB) per doubling of distance (Shilling 1993). A decibel level of 30 is characterized as somewhere between “quiet” and “very quiet” and equates to a quiet rural area (OMSI 2005). Assuming an OHV emitting a sound pressure of 99 dB at 20 inches from the exhaust opening (the highest that Oregon State law allows in this area), the sound would dampen to 45 dB at about 4,700 feet or 0.89 miles from the source (Sengpiel audio 2009) and would probably not be heard by the casual observer. Therefore, most people who are likely to be annoyed by the sounds of OHVs would not be annoyed at distances over 0.89 miles because they would probably not hear the sounds. When the effects of terrain, vegetation, wind, and higher background sounds are included, that distance can be shorter.

Even if an OHV cannot register on a sound meter, some people may still hear the sound and could be annoyed by it. A sound source such as an OHV can be clearly audible above the background, in some cases, even if its measured sound level is below that of the background (Harrison et al. 1993). This is especially evident if a person knows or thinks the sound is happening.

Alternatives 2-4

Direct and Indirect Effects for Sound from OHVs

Table 45 displays the areas where sounds may be heard at greater than 45db when OHVs are riding on the designated OHV trail system by alternative. Using the threshold for clearly audible sound at 0.45db, it is assumed this would be the boundary for effects associated with noise from motorized vehicles. Other effects disclosed are generally limited to the site-specific discussions.

Table 45. Sites/Areas from which sounds of OHVs might be audible at > 45 db.

Site/Area	Alt 2	Alt 3	Alt 4
Dispersed Camping Sites	35	18	37
Dispersed camping roads within noise band (miles)	65	26	73
Equestrian Endurance Event Route (miles)	1.89	1.46	2.12
Keeton Trail (miles)	0.03	0.02	0.02
Scotts Camp	X		X
Ochoco Divide Sno-Park	X	X	X
Keeton Trailhead	X	X	X
Cold Springs Cabin			
Cottonwood Pit	X	X	X
Crystal Springs Organizational Camp		X	X
ROS acres within noiseband by ROS Classification			
Roaded Modified	10,837	5,818	12,771
Roaded Natural	1,668	1,059	2,220
Semiprimitive Non-Motorized	276	117	292

Geology

All the percentages listed in this section are based on the acres of federal and private land contained in the project boundary.

The project area is underlain mainly by a mixture of rhyolite, basalt, andesite and sedimentary rocks. The climate 60 million years ago to the present has evolved from a warm moist tropical regime to the temperate four distinct seasons of today. The tectonic movement, uplift of the Blue Mountain anticline and mass wasting processes combined to create the moderately dissected and hummocky terrain which is the predominant landform. Landslides played a major role in the shaping of the watersheds creating large areas of hummocky terrain, seeps, ponds and springs. Present day erosion processes are primarily sheet and rill with minor mass wasting in the form of small landslides, rock topple and slope creep. The watersheds are a groundwater recharge collection area for regional and local aquifers. Mt. Mazama erupted approximately 7,000 years ago, depositing a 1.5 feet thick blanket of volcanic ash across the Ochoco Mountains. This volcanic ash has mixed with the evolving soils. Annual precipitation ranges from 15 to 31 inches per year.

The planning area encompasses the Large Meadow Complex, North Slope Ochoco, Scab Stringer and South Slope Ochoco Level 5 Ecoregions, which have a broad range of characteristics.

Existing Condition

Lithology

The Ochoco Summit project area lies within portions of 9 separate fifth-field watersheds. For the purposes of this project, the lithologies with similar erosion characteristics have been lumped together. The Quaternary alluvium, landslide terrain and fanglomerate are moderately to highly erosive and composed of unconsolidated materials; these underlie 7% of the project area. The Quaternary basalt and Quaternary/Tertiary basalt are more resistant lava flows (<0.01%). The Clarno Formation, Tertiary sedimentary and the John Day Formation are moderately erosive, being composed of volcanic sandstones, pyroclastic tuff and mudflows; these comprise 21% of the project area. The Tertiary Picture Gorge Basalt, Tertiary volvanic intrusive, Tertiary, Tertiary rhyolite and Tertiary are primarily resistant to erosion, composed of rhyolite, andesite and basalt flows; these

comprise 72% of the project area. The Mesozoic Cretacious Sedimentary units are moderately erosive (<0.05%). Table 46 summarizes the project area lithologies.

Table 46. Lithology across the Ochoco Summit OHV project area by watershed.

Watershed (5th Order)	Quaternary Highly Erosive (acres)	Quaternary Resistant (acres)	Tertiary Moderately Erosive (acres)	Tertiary Resistant (acres)	Mesozoic Moderately Erosive (acres)	Total Acres
Bridge Creek	5750	0	5664	4027	154	15595
Deep Creek	270	0	0	54292	0	54562
Lower Beaver Creek	92	17	696	22805	0	23610
Lower North Fork Crooked River	0	3	0	21455	0	21457
Mountain Creek	7599	0	6279	5366	0	19244
Paulina Creek	0	0	0	16095	0	16095
Rock Creek	1335	0	0	12845	0	14180
Upper North Fork Crooked River	3325	0	9222	76239	0	88786
Upper Ochoco Creek	2200	0	42507	3126	0	47833
TOTAL	**20,571 (7%)**	**20 (0.01%)**	**64,368 (21%)**	**216,250 (72%)**	**154 (0.05%)**	**301,362**

Landslide Terrain

Although the lithology map shows landslide terrain, the scale of mapping doesn't always pick up the rest of the dormant or active landslide terrain. Between field investigations and aerial photo interpretation, additional acres have been identified for the planning area (Table 47).

Table 47. Landslide terrain by subwatershed (acres) in the Ochoco Summit project area.

Watershed (5th Order)	Active Landslide (Acres)	Dormant Landslide Terrain (Acres)	Watershed (5th Order) Total Acres	Percentage (active) Dormant
Bridge Creek	8	9361	15595	(0.05%) 60%
Deep Creek	0	642	54562	1.2%
Lower Beaver Creek	0	158	23610	0.7%
Lower N Fork Crooked River	0	0	21457	0%
Mountain Creek	0	8674	19244	45%
Paulina Creek	0	23	16095	0.1%
Rock Creek	0	1584	14180	11.2%
Upper N Fork Crooked River	0	7446	88786	8.4%
Upper Ochoco Creek	4	11441	47833	(0.01%) 24%
TOTAL	**12**	**39329**	**301,362**	**(0.004%) 13%**

Transportation Network

An extensive system of National Forest System Roads exists within the analysis area. The road system crosses various types of lithology described above as well as some of the landslide terrain. Subsequent to the establishment of the 2005 Travel Management Rule, the Regional Forester of the Pacific Northwest Region issued direction that an Engineering Analysis would be required for any National Forest System Road designated for mixed use (allowing use by both highway-legal and non-highway-legal vehicles). As part of implementation of the Travel Management Rule on the Ochoco National Forest, a mixed use analysis has been performed to establish the suitability of allowing mixed use on roads in the context of their current setting in terms of alignment, width, typical user speed, and presence or absence of traffic control devices. Mixed use roads are available for travel by Off Highway Vehicles (OHV) as displayed on the current Motor Vehicle Use Maps (MVUM). Within the analysis area the 2012 MVUM allows for mixed use on 659 miles of ML2 roads.

A number of mineral sources exist within the analysis area. These sites have been utilized for extraction of gravel, rip rap, boulders or other rock products. Some mineral sources are available for travel by Off Highway Vehicles (OHV) as displayed on the current Motor Vehicle Use Maps (MVUM). Within the analysis area the 2012 MVUM allows motorized use on designated portions of the following mineral source areas: Crystal, Ahalt, Walton Lake, Scott's Camp, Aspen, Remington, Thornton, Podo Meadow, Grasshopper, Flow Top, Juniper and Six Corners. Although the actual acres at risk for introduction or expansion of existing populations of noxious weeds within mineral sources are a small percentage of the overall forest acres, an introduction of invasive plants at these sites could mean the closure of the area as an aggregate source for use on the Forest. This could result in increased aggregate haul costs on future projects.

Environmental Effects

Alternative 1 (No Action)

Implementation of Alternative 1 would result in no changes from the current conditions in the project area. The mileage of open and closed roads, and the resultant road densities, would remain as they are. Motorized travel would be permitted on designated routes only, as described by the MVUM, on mixed use roads.

Effects Common To All Action Alternatives

To varying degrees, each of the three Action Alternatives incorporates the use of mixed use roads to provide designated connectivity throughout the project area within and between portions of the designated trail system. Specific information is included for each alternative later in this section.

To varying degrees, each of the three Action Alternatives incorporates the use of mineral sources as OHV staging or other OHV areas. Specific information is included for each alternative later in this section.

The Mazama Ash component of the soils (see section titled "Soils" in Chapter 3 of this document) provides an erosive potential for the systems, especially when on a grade.

All action alternatives cross a number of Class 1, 2, 3 and 4 stream systems. As part of the protection for the streams, a combination of bridges, culverts, boardwalks and hardened fords have been proposed. Specific information is included for each alternative.

Where new routes cross dormant landslide terrain, the concern is for the protection of any seeps or springs the route might cross. Initiating large scale slope stability isn't a concern with these routes, however, there is the potential to see smaller sloughs created by routes on steeper slopes or coming into drainages. Specific information is included for each alternative.

Recreational use of mineral material sources may result in introduction and/or spread of invasive plant species into the material source. Invasive species can compromise the utility of the sources because materials that are used for Forest Service projects must be weed-free in order to prevent the spread of invasive species to new project areas.

Alternative 2 (Proposed Action)

Under Alternative 2, a combination of Class I, Class II and Class III routes total 170 miles of designated OHV trail system that cross different lithologies with varying resistance to erosion (Table 48). Segments of the proposed routes also cross dormant landslide terrain (Table 49). The distribution of the designated OHV trails for this alternative begins on Hwy 26, passing from Hwy 26 to Walton Lake, across the slope north of Big Summit Prairie to Six Corners on Paulina District. The routes are a combination of existing roads in open, closed and decommissioned status and new routes.

Table 48. Lithology for each proposed trail type in Alternative 2 of the Ochoco Summit project (acres).

Type	Quaternary Landslide Terrain	Clarno Formation	Tertiary Picture Gorge Basalt	John Day Formation	Grand Total
Class I/New Route	1.41	2.58	14.53	0.22	**18.75**
Class II/New Route	0.09	0	11.81	0.05	**11.95**
Class III /New Route	0.37	0	12.05	0	**12.41**
Closed/Decommissioned	0	4.58	74.80	0	**79.39**
Open Roads	2.41	0.08	62.90	2.18	**67.57**
Grand Total (acres)	**4.28**	**7.25**	**176.09**	**2.46**	**190.07**

Table 49. Acres of dormant and active landslide terrain for each trail type in all action alternatives of the Ochoco Summit project.

Trail Type	Active Landslide Terrain			Dormant Landslide Terrain			Grand Total
	Alt. 2	Alt. 3	Alt. 4	Alt. 2	Alt. 3	Alt. 4	
Class I/New Route	0	0	0	1.29	2.34	3.39	**18.75**
Class II/New Route	0	0	0	1.93	0	0.5	**11.95**
Class III /New Route	0	0	0	0.36	0.23	0.14	**12.41**
Closed/Decommissioned	0	0	0.05	3.00	3.68	6.44	**79.39**
Open Roads	0	0	0	1.95	0.67	1.97	**67.57**
Grand Total	**0**	**0**	**0.05**	**9.57**	**6.88**	**12.44**	**190.07**

Alternative 2 proposes construction of three play areas, six trail heads, one parking area and a total of ten staging areas split between the three vehicle classes: six staging areas for the Class I (ATV), two staging areas for the Class II (jeeps) and two staging areas for the Class III (motorcycles). The OHV areas are spread across the proposed trail route. The majority of the trailheads, play areas and staging areas are on Picture Gorge Basalt, which in general is relatively resistant to erosion. The play area, staging area and the parking area at Ahalt are on dormant landslide terrain. The staging area and the parking area at Bandit Springs Snow Park are underlain by the John Day Formation. One trail head is underlain by the John Day Formation. Four of the ten staging areas are located in active mineral material sources (Six Corners, Aspen, Walton Lake and Scott's). Three mineral material sources (Thornton, Scott's Camp and Ahalt) are ready for reclamation; converting them to staging areas, play areas or trail heads is a reasonable next use. Thornton Material Source is also known as Cottonwood Pit. Of the mineral material sources included as staging areas, trail heads or play areas under Alternative 2, the Scott's mineral source is the only one not already open to year-round cross-country travel under the MVUM. There would be increased potential for introduction of invasive plants compared to No Action at this site. There may also be increased potential for introduction or spread

of weeds at the other three active mineral material sources due to increased traffic resulting from being included in a designated motorized trail system.

Alternative 3

Under Alternative 3, a combination of Class I and Class III routes that cross different lithologies with varying resistance to erosion are proposed (Table 50). Implementation of Alternative 3 would result in 101 miles of designated trail system being developed from a combination of new routes and existing roads currently in open, closed and decommissioned status (Table 50). Segments of the proposed routes also cross dormant landslide terrain (Table 49). The distribution of the designated OHV trails for this alternative includes a western system between Hwy 26 and Indian Butte and an eastern system between Peterson Creek and Six Corners.

Table 50. Lithology for each proposed trail type in Alternative 3 of the Ochoco Summit project (acres).

Type	Quaternary Landslide Terrain	Clarno Formation	Tertiary Picture Gorge Basalt	Grand Total(acres)
Class I/New Route	1.94	5.45	5.85	**13.24**
Class III /New Route	0	0	13.73	**13.73**
Closed/Decommissioned	0	13.69	39.92	**53.61**
Open Road	1.28	1.16	17.66	**20.10**
Grand Total	**3.22**	**20.3**	**77.16**	**100.68**

Alternative 3 proposes construction of 4 staging areas: two staging areas for the Class I (ATV), two staging areas for the Class III (motorcycles). The OHV areas are spread across the proposed trail route. Two of the four staging areas are located in active mineral material sources: Six Corners and Walton Lake. One staging area is located in a closed material source: Thornton (Cottonwood Pit). The fourth area is the Bandit Springs snow park.

The majority of the staging areas are on Picture Gorge Basalt, which in general is relatively resistant to erosion. The staging area and the parking area at Bandit Springs Snow Park is underlain by the John Day Formation.

Of the mineral material sources included as staging areas under Alternative 3, all are already open to year-round cross-country travel under the MVUM. There may be increased potential for introduction or spread of weeds at the two active mineral material sources proposed as staging areas due to increased traffic resulting from being included in a designated motorized trail system.

Alternative 4

Implementation of Alternative 4 would result in 212 miles of designated trail system being developed from a combination of new route and existing roads currently in open, closed, or decommissioned status (Table 51). These routes cross different lithologies with varying resistance to erosion; segments of the proposed routes also cross dormant landslide terrain (Table 49). The distribution of the designated OHV trails for this alternative begins on Hwy 26, passing from Hwy 26 to Walton Lake, across the slope north of Big Summit Prairie to Six Corners on Paulina District, with additional loop trails for Class I, Class II and Class III vehicles.

Table 51. Lithology for each proposed trail type in Alternative 4 of the Ochoco Summit project (acres).

Type	Quaternary Landslide Terrain	Clarno Formation	Tertiary Picture Gorge Basalt	John Day Formation	Total (acres)
Class I/New Route	2.55	6.94	20.76	0.58	30.82
Class II/New Route	0	0	10.86	0	10.86
Class III/New Route			10.71	0	10.71
Closed/Decommissioned Roads	0	24.87	83.05	0.50	108.42
Open Roads	1.87	2.84	69.74	2.71	77.16
Grand total	**4.42**	**34.65**	**195.13**	**3.78**	**237.97**

Alternative 4 proposes construction of one play area and a total of ten staging areas split between the three vehicle classes: six staging areas for the Class I (ATV), two staging areas for the Class II (Jeeps) and two staging areas for the Class III (motorcycles). The OHV areas are spread across the proposed trail route.

For Alternative 4, the majority of the staging areas are on Picture Gorge Basalt, which in general is relative resistant to erosion. The play area and staging area at Ahalt are on dormant landslide terrain. One staging area is underlain by the John Day Formation. Three of the ten staging areas are located in active mineral material sources (Six Corners, Walton Lake and Scott's). Two mineral material sources (Thornton and Ahalt) are ready for reclamation; using them next as staging areas or play areas is reasonable. Thornton Material Source is also known as Cottonwood Pit.

Of the mineral material sources included as staging areas or play areas under Alternative 4, the Scott's mineral source is the only one not already open to year-round cross-country travel under the MVUM. There would be increased potential for introduction of invasive plants compared to No Action at this site. There may also be increased potential for introduction or spread of weeds at the other three active mineral material sources due to increased traffic resulting from being included in a designated motorized trail system.

Cumulative Effects

The Travel Management decision (2011) prohibited motorized vehicle use except on designated routes and in designated areas. Due to reduced opportunity for OHV recreation, that decision may result in increased use of mineral material sources as OHV play areas; that could combine with the designation of material sources in these action alternatives to increase the risk of introduction of invasive species to mineral material sources in the project area.

Soils

Management Direction

Soil Compaction and Displacement

The Forest Plan (p. 4-196) identifies the following standard and guideline for soil compaction and displacement:

> The threshold level of detrimental compaction is defined as any bulk density increase of 15% or more (for residual soils and 20% for ash soils) or more. Or any macro pore space reduction of 40% or below 15%. These values are critical changes over the natural state in the top 12 inches.
>
> In order to maintain site productivity, all project activities will be planned to reduce soil compaction and displacement to the lowest reasonable level. Strive to reduce compaction and

displacement to get as close to 90 percent of the total activity area (including permanent, rocked, and non-surface roads) remaining in a non-compacted/non-displaced condition, as realistically possible, one year after any land management activity. The minimum will be 80 percent of the total activity area. Existing areas exceeding these standards will be scheduled for rehabilitation as soon as possible. An activity area is the total area for which a ground disturbing activity is planned, for example, a unit for a timber sale, slash disposal project, or grazing allotment. The area would also include transportation systems within and directly adjacent to the project.

On August 24, 1998, the Pacific Northwest Regional Forester issued a supplement to the 2520 Forest Service Manual (R-6 Supplement No. 2500.98.1). This supplement clarifies direction for planning and implementing activities in areas where soil standards are exceeded from prior activities:

2520.3 – Policy. Design and implement management practices which maintain or improve soil and water quality. Emphasize protection over restoration.

When initiating new activities:

1) Design new activities that do not exceed detrimental soil conditions on more than 20 percent of an activity area (this includes the permanent transportation system).
2) In areas where less than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current activity following project implementation and restoration must not exceed 20 percent.
3) In areas where more than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration must at a minimum, not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality.

2521.03.3 - Application of Soil Quality Standards.

Planning. Use soil quality standards to guide the selection and design of management practices and prescriptions on a watershed scale. Evaluate existing soil conditions on all ownerships within the watershed and consider cumulative effects with the addition of proposed actions on ecosystem sustainability and hydrologic function. On a planned activity area, evaluate existing soil conditions and design activities to meet soil quality standards. Document adjustments to management practices, soil conservation practices or restoration techniques necessary to meet threshold values for the affected soil properties and watershed conditions.

Erosion

The Forest Plan (page 4-196) directs that land management activities will be planned to achieve effective ground cover as displayed in Table 52.

Table 52. Effective ground cover objectives from the Ochoco Forest Plan (page 4-196).

Erosion Hazard Class	Minimum % effective ground cover, First Year	Minimum % effective ground cover, second year
Low	20-30	30-40
Moderate	30-40	40-50
Severe	50-60	60-75
Very Severe	60-75	75-90

Effective ground cover is defined as the basal area of perennial vegetation, plus litter and coarse fragments (greater than 2mm sizes), including tree crowns and shrubs that are in direct contact with

the ground. Exceptions may occur where specific projects meet erosion control objectives without meeting the ground cover objectives stated above.

Soil Mass Wasting

The Forest Plan (page 4- 196) directs that when a project could result in an increased potential for mass wasting, which could cause significant soil loss or sedimentation, hazards to property, loss of fish habitat, or damage to other resource values, alternative project proposals will be evaluated and documented through the project's environmental analysis.

Fragile Areas

The Forest Plan (page 4-197) directs project planners to recognize the sensitivity and potential of certain areas and/or situations to be adversely affected by management activities and plan accordingly to minimize those effects. Fragile areas include scablands (shallow soil areas), elk wallows, and other isolated soil areas which exhibit sensitivities that require special care.

Scablands

Scablands are recognized as among the most fragile ecosystems on the Ochoco National Forest. Damage to the soil and vegetation as a result of management activities is nearly impossible to mitigate. This is a result of their having very shallow soils which are subject to severe water saturation and frost heaving during winter, thus making revegetation virtually impossible. For this reason, all management activities will be analyzed as to their effect of scablands prior to implementation.

Existing Condition

Landtypes

The landtype is the basic unit of landscape stratification. It delineates and identifies naturally occurring bodies on the landscape consisting of unique characteristic features, such as soil mantle, bedrock, vegetation, climate, hydrology, and landform, which are significant to management use and interpretations (Paulson et al. 1977). An acreage summary by major landtype within the project area is provided in Table 53.

Table 53. Major landtypes in the Ochoco Summit OHV project area (from Paulson, 1977, ONF SRI).

Landtype Group	Acreage	Percent of Watershed- USFS Lands	Parent Material
P Landtypes	148,980	50	Picture Gorge Basalt
Y Landtypes	54,949	18.3	Basalt
T Landtypes	47,696	15.9	Tuffs- Clarno/John Day
L Landtypes	19,459	6.5	Landslide Debris
B Landtypes	14,584	4.9	John Day- Clarno Basalts and Tuffs
M Landtypes	6,817	2.3	Mixed Alluvium-Meadows
C Landtypes	4,061	1.4	Slope Colluvium
A Landtypes	1,819	0.6	Mixed Alluvium
S Landtypes	1,050	0.4	Basalt Scablands
X Landtypes	1,053	0.4	Tertiary Basalts

Landscape Patterns

Most of the project area is scab stringer terrain; this terrain typically has an average of 30 percent scabland plateaus dissected by timbered stringers. Soils within the stringer sides and bottoms have deeper ash soils. Deeper ash soils are typically classified as L2, L6, P1, P2, P9 and Y2 landtypes. These deep soils are also found on alluvial meadows (M landtypes). Approximately 82,082 acres

(27%) within the planning area are deeper ash soils. Approximately 78,230 acres (26 %) of the area is in non-forestlands. These include scablands, meadows and shrub lands. There are 57,354 acres (19%) of scabland in the Ochoco Summit project area. Scabland soils (largely P5, P54, P5Y, P85) range from very shallow to shallow (<20 inches to bedrock). Shrubland soils range from moderately deep to deep (from >20 to 60 inches). Most meadow soils (M landtypes) are deep to very deep (greater than 40 inches). The remaining land area approximately 140,274 acres (47%) are shallower ash soils or residual soils derived from basalt parent material.

Most of the project area is on relatively flat ground. Approximately 90% of the project area is on slopes less than 35%. Topography within this project area, which is in the Eastern Ochoco Mountains, has a lesser proportion in steep ground (over 35% slope) than other areas of Ochoco National Forest such as the Western Ochoco Mountains. This is fairly typical of Picture Gorge Basalt Formation terrain in the southwest Blue Mountain area. The Ochoco Mountains are the southernmost part of the Blue Mountains.

Infiltration and Runoff

Infiltration is very slow on the scablands on old basalt flow surfaces. Scablands function hydrologically as large "tin roofs" which shed runoff from rain and snowmelt very rapidly. Soils on these scablands are largely very shallow and shallow to bedrock. Many scab flats are incised with deep steep-sided drainways. Soils on these steep to very steep plateau drainages and lava flow scarps are moderately deep to deep on the northerly aspects and shallow to moderately deep on the southerly aspects. These drainway soils are derived from ash overlying or mixed with colluvium. The drain areas have served to collect wind and water eroded ash from the scablands which have lithic soils derived from basalt. The interface along the edge between scablands and the forested areas below them are sensitive areas. Infiltration in the deep ash soils is rapid to very rapid. These edge areas provide critical buffers that help slow down and dissipate the rapid runoff from the scabs.

Soil Compaction and Displacement

There are 57,354 acres of scabland in the Ochoco Summit analysis area. Soils on these areas (P5 landtype, for instance) are usually clayey and very rocky with greater resistance to detrimental compaction. However they are very susceptible to detrimental puddling and postholing by equipment, vehicles and large herbivores. Subsequently these soils are classified as sensitive soils for use and management. They are relatively resistant to damage when dry, but susceptible when saturated.

In this project area it is estimated that 180,386 acres have been harvested since 1950. It is estimated that 15 to 35% of the tractor harvested acres, approximately 26,625 acres (8.9% of the analysis area), have been detrimentally compacted and/or displaced. Outside of harvest units another 1 percent is estimated to be disturbed by road construction. The overall compaction level is estimated to be approximately 10% across the analysis area. Soils within this area of existing disturbance have potential to produce changes in runoff and timing of peak flows compared to undisturbed soils. Some of this detrimental disturbance from past management activities has recovered with natural recovery processes such as frost heaving, rodents, insects and root action. Depending on the severity of the disturbance recovery of soils from compaction or displacement can occur in 7 to 50 years.

Environmental Effects

General Effects of OHVs on Soils

COMPACTION/DISPLACEMENT: Detrimental compaction is defined as a 15% increase in bulk density for residual soils and a 20% increase for ashy soils (Region 6 supplement to the 2520 Forest Service Manual (R-6 Supplement No. 2500.98.1). Three to four passes with large heavy four wheel drives (Class II OHVs) may produce this effect. Lighter OHVs such as motorcycles, ATVs and lighter UTVs do not produce much compaction at depth. The major effect of compaction is reduction

in porosity resulting in reduced water and air availability to tree roots. There is also increased mechanical resistance to tree root growth. Mychorrizal symbiosis has also been shown to be decreased when soils are compacted. Clay surface soils with little or no ash capping commonly have clay loam surface A horizons quickly grading to heavier clay. These are generally on south and west facing aspects which are hotter and drier than north or east aspects. These soils are not generally susceptible to detrimental compaction and displacement, depending on the depth to the smectitic clay which shrinks and swells with each wet and dry season. OHV activity, as a contributor to erosion, is most pronounced along streams with ashy banks and steeper sideslopes on north and east aspects. Some Soil Resource Inventory Landtypes in this area which are largely ash soils are L26, P1, P2, T2, T6 and Y2.

DETRIMENTAL COMPACTION- this can have a negative effect on soil productivity**.** The reduction of soil pore space limits air, water and nutrient availability to roots. The reduction in infiltration results in higher peak flows, which means more energy for erosion and transport of sediment.

DETRIMENTAL DISPLACEMENT- this can have a negative effect of soil productivity. Detrimentally displaced soil has an altered hydrographic function and often does not allow normal growth to occur; the A horizon usually has been removed and piled up. Displaced soils are often channelized and loosened so than they are more susceptible to erosion from both water and wind. Wind erosion can be common along OHV tracks and dirt roads.

PUDDLING AND POSTHOLING: Puddling results from the breakdown of soil structure under wet conditions. Recreational vehicles (OHVs) can cause puddles to form in soils, potentially causing channelization and loss of permeability. Clay surface soils are susceptible to detrimental puddling (destruction of soil ped structure) via OHV vehicular traffic and will be susceptible to rutting and subsequent trail erosion during wet conditions such as thunder storms or spring thaw conditions. These are soils with little or no ash capping. They commonly have clay loam surface A horizons quickly grading to heavier clay. These are generally on south and west facing aspects which are hotter and drier than north or east aspects. Some Soil Resource Inventory landtypes in the project area that have shallow ash caps and clay closer to the surface are B4, B5, P5 and P3 landtypes.

WIND EROSION: Wind moves soil associated with vehicular traffic along roads and OHV trails. This contributes some fine sediment (commonly from volcanic ash) to waterways, although usually during the dry season only and at a much reduced rate compared to water transport from sheet, rill and gully erosion. Dust creation and wind erosion are more prevalent with the ash surface soils. The Ochoco Summit OHV project area contains approximately 82,082 acres of ash soils having at least 7 inches of surface ash. The deepest ash soils occur on the north and eastern aspects. The southern and western aspects have the least amount of ash deposits. OHV activity, as a contributor to erosion, is most pronounced along streams with ashy banks and steeper sideslopes on north and east aspects. The streams with S and W aspects often have more rock and clay exposed which gives them somewhat more resistance to vehicular tire impacts. Some Soil Resource Inventory Landtypes in this area which are largely ash soils are L26, P1, P2, T2, T6 and Y2.

OVERLAND FLOW: Overland flow occurs when the infiltration rate or capacity of a soil has been exceeded by the amount of incoming precipitation or by the rate of snowmelt. Independent variables include all the soil and plant factors that influence infiltration rate, intensity and duration of precipitation, steepness of slope and whether or not the soil is frozen. The magnitude of management-induced overland flow increases over background levels is the major concern.

The volcanic ash soils of the Blue Mountains have several properties that can make erosion hazard assessment difficult. In an uncompacted state, these soils have infiltration rates often exceeding 10 inches per hour. Permeability of applied water through the ash layers is also rapid. However, because of their lack of structural development (weak granular to singular grain), they are easily susceptible to erosion in situations where water is channeled on the soil surface such as roads, waterbar outlets, and

near drainage structures (Ash Soil Guidelines for OR/WA 1985). Trails also have potential to channel water. Seasonal OHV use restrictions help prevent rutting and subsequent flow concentrations. This reduces potential for sediment delivery to drainways.

MECHANICAL IMPACTS: OHV trail use damages soils when the type and level of use exceed the soil's capacity to resist impact. A soil's capacity to resist impact varies depending on textural class, moisture level, and other environmental and site characteristics, but the processes by which soils are impacted are generally the same. Trail use damages soils directly by mechanical impact from surface traffic and indirectly by hydraulic modifications, soil transport, and deposition. The southern and western aspects have the least amount of ash deposits, often having more rock and clay exposed, which gives them somewhat more resistance to vehicular tire impacts. OHV activity, as a contributor to erosion, is most pronounced along streams with ashy banks and steeper sideslopes on north and east aspects.

Direct mechanical impact has several components: abrasion, compaction, shearing, and displacement.

- Abrasion strips surface vegetation and roots.
- Compaction reduces soil voids and causes surface subsidence.
- Shearing is the destructive transfer of force through the soil.
- Displacement results in the mechanical movement of soil particles.

Indirect impacts include hydraulic modifications, such as the disruption of surface water flow, reductions in infiltration and percolation, surface ponding, and the loss of water-holding capacity. Other indirect impacts include those associated with erosion: the loss of soil particles by wind or water erosion and deposition of transported particles. An associated impact is the hydraulic pumping that occurs when a destructive flow of water is forced through a saturated soil.

Both direct and indirect impacts can degrade soils along trail segments. The impacts generally occur in the following progression:

Abrasive loss of protecting surface vegetation, organic material and root mass (direct impact)

↓

Compaction and surface subsidence (direct impact)

↓

Hydraulic disruption (indirect impact)

↓

Breakdown of soil structure from shearing and pumping (direct impact)

↓

Soil particle erosion and deposition (indirect impact)

While most of the stages in this progression are familiar concepts, the shearing and pumping components may not be as familiar to some readers.

Shearing describes a transfer of force through a soil. When an applied force exceeds the capacity of the soil body to absorb it, a portion of the soil body can be displaced along a shear plane, that place where soil particle cohesion is weakest. The most common example is when the passage of a wheeled vehicle forms ruts. The downward force of the wheel shears--or displaces--the soil beneath it, forcing the soil to bulge upward beside the wheel. The shearing action destroys soil structure by crushing soil

peds (natural soil aggregates) and collapsing voids. Shearing is most likely to occur on finely textured soils under moist to saturated conditions. It is uncommon in coarse soils.

Shearing and pumping actions reduce soils to a structureless or "massive" condition. This condition is characterized by the loss of distinguishable soil structure and a reduction in pore space voids, and interped passages (the space between peds). An example of soil in a massive state is a dried mud clod or an adobe brick. In a massive state, soils have significantly reduced infiltration rates, percolation, water storage capacity, and gas exchange. This reduces a soil's ability to support vegetation growth, leads to surface ponding of water, and increases the soil's sensitivity to additional impacts.

Trail use has a predictable path of surface impact. The degree of impact is modified only by the natural resilience of the soil, enhanced resistance through amendments and the intensity of trail use. In an ideal situation, a natural balance is maintained between soil resilience and use, and trail use occurs without significant soil degradation. However, on sites with wet, unstable, and sensitive soils, that equilibrium is easily upset. Even low levels of trail use can have environmental consequences if not carefully designed, constructed and maintained.

Typically, trail degradation follows one of two pathways: surface erosion or surface failure. Surface erosion occurs when wind or water displaces exposed trail surfaces. This usually occurs on steep terrain or on sandy soils that are susceptible to wind erosion. Surface failure occurs when trail surfaces degrade into muddy tracks with deep muck holes. This usually occurs on flat areas with finely textured soils. Either pathway can lead to environmental impacts that are extremely difficult to stabilize or reverse. Without stabilization, expansion of soil degradation can begin that leads to impacts to adjacent surfaces. This cycle begins with the widening of trail surfaces as users avoid degraded surfaces and impacted area expands along with the development of multiple parallel trails.

Soil compaction can lead to surface subsidence (the lowering of the trail relative to the adjacent ground surface). Trails can become entrenched. This lower surface intercepts and drains water from adjacent surfaces and channels that flow along the trail. This dramatically increases the risk of water erosion on sloped areas and the pooling of water in low-lying sections. As with surface erosion, without stabilization or adequate surfacing, expansion of soil degradation can begin that leads to impact to adjacent surfaces. When trail surfaces degrade due to rutting or the formation of muck holes, users may widen the trail and seek new routes, usually on adjacent soils where environmental conditions are identical to the original impact site. This cycle may repeat itself until the area is scarred with a number of routes in various stages of use and abandonment. This condition is called trail braiding. Trail braiding can significantly expand the environmental impacts of trail use. Trail braiding may occur when trail use levels repeatedly exceed the carrying capacity of soils to support that use (USDA Forest Service Technology and Development Center; 2002, Managing Degraded Off-Highway Vehicle Trails in Wet, Unstable, Sensitive Environments; 0223-2821-MTDC).

Crossings with routes that are not part of the proposed trail system (such as old skid trails, user created routes and closed roads) will be blocked through entrance closures and camouflage such as logs, rocks and slash. Scarification of soil surfaces in preparation for seeding or planting as part of the rehabilitation of these unwanted routes may occur. The main purpose of tillage or scarification is to decompact the soil such that there is an improvement in soil moisture infiltration and aeration. Resistance to root growth is lessened also. There are potential short term and long term effects of tillage or scarification. The long term effects are largely beneficial due to the improved infiltration, percolation, aeration and lessened bulk density. Short term effects may include increases in localized erosion potential before effective vegetative ground cover is established. This short term hazard will be reduced by the use of water bars and slash placement.

Microbiotic crusts are formed by living organisms and their byproducts, creating a crust of soil particles bound together by organic materials. Chemical and physical crusts are inorganic features, such as a salt crust or platy (vesicular) surface crusts. These crusts are more prevalent on the scabland

soils and on interspaces between rocks along the edges of timbered stringers. These crusts can be disturbed by vehicle and animal hoof action. There are approximately 57,354 acres of scabland in the analysis area. Existing trails and roads will be used in these areas to the extent that they are available to avoid creating new disturbance. Some new disturbance will be unavoidable as is described for each alternative below. New routes on scabland increase the potential for disturbance of soil crusts.

Each action alternative may require installation of new cattle guards (see section titled "Range Resources" in Chapter 3 of this document). Effects to soils would be minimal as most of the cattle guard-related activity would be within the existing road prism or other existing disturbance.

Alternative 1

This alternative proposes no management actions that would affect the soil resource in the short term. Existing natural processes would continue. No soil restoration tillage would be performed under this alternative. Recovery of existing soil (compaction) would occur through natural processes. These processes include frost heaving in the top 4 to 6 inches of soil and biopedoturbation (soil disturbance by organisms such as rodents, insects, arthropods and various worms). These natural processes can take 10 to 50 years or more to fully restore damaged ash soils, while clayey residual soils may recover in 1-2 years due to shrinking and swelling actions. OHV travel would proceed as currently allowed, restricted to designated mixed use roads as displayed on the MVUM maps. Alternative 1 would meet Forest and Regional Standards and Guidelines for soils.

Alternative 2

This alternative proposes the second most trail miles (170 miles, 237 acres), 142 stream crossings, 10 staging areas and 6 trailheads. New routes would comprise 69 miles (31.7 acres). See Table 54 for comparison of acreages.

This alternative has the second most potential (of the three action alternatives) to increase the amount of detrimental soil compaction, displacement, and sedimentation. Short term impacts to uplands soils and streambanks would occur with initial trail construction such as contouring (blading, excavation), bridge construction (excavation of abutments) and culvert placement (excavation and filling). Longer term potential sedimentation would be reduced with these crossing features and the installation of relief culverts, water bars, rolling dips and bed armoring near crossings.

The total distance of OHV trails proposed in Riparian Habitat Conservation Areas is 17.22 miles, most of which would be on existing crossings. Trail design standards such as bridges, culverts and armored fords and trail approaches plus seeding would reduce sediment delivery potential at these points. Effects would be unmeasurable in the long term as seeded and planted vegetation becomes established, providing effective cover for construction disturbance adjacent to the trail beds. Short term construction impacts would occur in the first year or two.

Implementation of this alternative would comply with the regional soil standards.

Alternative 3

This alternative proposes the fewest trail miles (101 miles, 83 acres), 62 stream crossings, 4 staging areas. New routes would comprise 50 miles (17.9 acres). No Class II OHV trails for jeeps and small trucks (80 inch category) would be included in this alternative which contributes to the reduction in impacted acreage. See Table 54 for comparison of acreages.

This alternative would result in the fewest trail impacts of all the action alternatives; this alternative has the least potential to increase the amount of detrimental soil compaction, displacement, and sedimentation. Short term impacts to uplands soils and streambanks would occur with initial trail construction such as contouring (blading, excavation), bridge construction (excavation of abutments) and culvert placement (excavation and filling). Longer term potential sedimentation would be reduced with these crossing features and the installation of relief culverts, rolling dips and bed armoring near

crossings. Planting of native or cultivars of native species of grass and/or shrubs will help in providing effective cover for construction disturbance adjacent to the trail beds.

The total distance of OHV trails proposed in Riparian Habitat Conservation Areas is 17.22 miles, most of which would be on existing crossings. Trail design standards such as bridges, culverts and armored fords and trail approaches plus seeding would reduce sediment delivery potential at these points. Effects would be unmeasurable in the long term. Short term construction impacts would occur in the first year or two.

Implementation of this alternative would comply with the regional soil standards.

Alternative 4

This alternative proposes the most trail miles (212 miles 173 acres), 170 stream crossings and 10 staging areas. New routes would comprise 81 miles (38.4 acres). See Table 54 for comparison of acreages.

This alternative proposes the most trail impacts overall. This alternative has the most potential (of the three action alternatives) to increase the amount of detrimental soil compaction, displacement, and sedimentation. Short term impacts to uplands soils and streambanks would occur with initial trail construction such as contouring (blading, excavation), bridge construction (excavation of abutments) and culvert placement (excavation and filling). Longer term potential sedimentation would be reduced with these crossing features and the installation of relief culverts, rolling dips and bed armoring near crossings. Planting of native or cultivars of native species of grass and/or shrubs will help in providing effective cover for construction disturbance adjacent to the trail beds.

The total distance of OHV trails proposed in Riparian Habitat Conservation Areas is 22.04 miles, most of which would be on existing crossings. Trail design standards such as bridges, culverts and armored fords and trail approaches plus seeding would reduce sediment delivery potential at these points. Effects would be unmeasurable in the long term as seeded and planted vegetation becomes established, providing effective cover for construction disturbance adjacent to the trail beds. Short term construction impacts would occur in the first year or two.

Implementation of this alternative would comply with the regional soil standards.

Table 54. Miles/acres of proposed trails by alternative.

	No Action			**Proposed Action**			**Alternative 3**			**Alternative 4**		
OHV Vehicle Class	I	II	III	I	II	III	I	II	III	I	II	III
Total Route Miles	0	0	0	69	49	52	38.5	0	62.4	129	30	52
Total Route Acres	0	0	0	53.3	39.3	45.7	27.4	0	55.6	104.8	21.1	46.7
New Route Miles Portion of Total	0	0	0	31	12	26	22	0	28	48	11	22
New Route Acres Portion of Total	0	0	0	15.7	9.7	6.3	11.1	0	6.8	24.2	8.9	5.3
Miles of Trail in Riparian Hab. Cons. Areas (RHCAs) by Vehicle Class	0	0	0	7.9	5.1	4.2	2.3	0	5.04	12.8	4.3	4.9
Total RHCA trail miles by Alternative	0	0	0	17.22			7.34			22.04		
Stream Crossings-by OHV class				61	56	25	26	0	36	107	41	22

Table 54. Miles/acres of proposed trails by alternative.

	No Action	Proposed Action	Alternative 3	Alternative 4
Stream Crossings-Total	0	142	62	170
Staging Areas*	0	10	4	10
Trailheads*	0	6	0	0
Play Areas*	0	3	0	0
Parking*	0	1	0	0

Vehicle Class: Class I- ATV (50" wide trail); Class II-Jeep or Small Truck (80" wide trail); Class III-Motorcycle (24" wide trail).

***Note:** Staging areas (ave 3 acres each); Trail Heads (ave. 2 acres each) and Play Areas (ave 1 acre each along with the parking area (ave 1 acre) are mainly in existing rock pit areas or snow park areas which have rocked, graveled or paved surfaces and are armored against wind and water erosion thereby limiting any potential sediment movement.

Cumulative Effects

Reasonably Foreseeable Activities

Livestock Grazing: The following allotments overlap the analysis area: Burn, Marks Creek, Crystal Spring, Snowshoe, Canyon Creek, Reservoir, Lookout, Brush Creek, Pringle, Antler, Gray Prairie, Lost Horse, North Fork, Fox Canyon, Big Summit, Deep Creek, Roba, Pisgah, Elkhorn, Badger, Indian Creek, Happy, Derr, Little Summit, Wolf Creek, Rock Creek, Bearskull/Cottonwood and Buck Pasture. Twenty-five of the allotments are active allotments; one allotment is grazed by sheep, and the remaining active allotments are grazed by cattle. Cattle will continue to have an effect on riparian soils in this area. Impacts from sheep on riparian areas are usually limited to crossings and watering sites as the flocks are managed by herding.

With implementation of the selected alternative from the Travel Management Project Final Environmental Impact Statement for the Deschutes and Ochoco National Forests and Crooked River National Grasslands, the national forests and grassland will be closed to motorized travel unless designated open. Motorized travel will be restricted to designated routes and to within 300 feet of these designated routes. Green dot restrictions would continue to be in effect on the Paulina District and South Boundary portions of this analysis area. Uncontrolled OHV use may occur from spring through fall, mainly associated with antler hunting, mushroom gathering, spring turkey hunting, general recreation, camping and big game hunting. Localized impacts may continue, mainly associated with dispersed recreation sites.

Timber sales associated with the Howard Elliot Johnson, Jackson and Canyon Projects are currently being implemented in the Ochoco Summit project area. These are largely thin from below silviculture treatments and will meet INFISH guidelines with regard to stream buffers and stream protection measures identified in the Riparian Management Objectives (RMOs).

Completed Activities and Events

The effects of past timber sales are included in the analysis of the existing condition. Past sales within the project area include a variety of harvest prescriptions. Records from the Big Summit and Paulina Ranger Districts indicate the following amount of past harvest treatments within the area since 1980:

- Regeneration Harvest Total – 5108 acres (tractor only)
- Overstory Removal – 5,508 acres.
- Partial Removal Cutting (thinning, selection cutting) – 16,009

These sales include: 1960s: Marks Creek, Wolf Creek, Bug Creek, Metal Creek; 1970s: Jackson Creek Salvage, 1980s: Haypress-Buker, Jackson, Lava, Happy Dead, Chuckles Dead, Deadwood Salvage, Dendro Salvage, Crazy, Woodrow, Aspen, Brer Rabbit, Yuma, Alder, Blue Bull, Bull Pine, Sugar, Watson, EP, Connally, Fry, Hewed Log, Indian, Round Meadows; 1990s: Alder, Connally, Indian, Watson, Yuma, Davis Spring, Fry, Indian, Indian Butte, Lutsey, Chamberlin, DCWR, Fry, Koch, Potter, Rainier, Thunder, Beaverfield Claypool, H & G, Rough, Upper Al, Chuckwagon, Hedgepath, 2210 Salvage, Marks, Morgan, Ochococreek, Coyle Salvage, Howie, Morgan, Pisgah Fiber, Deep Salvage, Dippy Beaver, Harpo, Aqua, Summit, Fryton, Gray, Barn, Biscuitroot, Blackbear; 2000s: Barn, Biscuitroot, Blackbear, Gray, Summit, Jungle, Flat Bucket, Fryton, Zane, Halfway.

Additional harvest prior to 1980s is known to have occurred in the area but is not recorded in the district GIS records. Historical records indicate that harvest was likely occurring within the project area as early as 1950 and covered much of the forested lands within the project area. This older harvest was primarily focused on individual tree harvest, often removing large high value trees that were deemed at risk to insect mortality.

In 2006 the Maxwell Fire burned approximately 7,145 acres within the planning area. The majority of the area burned at a low intensity with little effect on tree species and structure.

In 2008 the Bridge Creek Fire burned 4,891 acres largely in the Bridge Creek Wilderness and adjacent private grounds. Effective ground cover was recovered to the 60 to 80 percent level in 2 years after burning (J. David, personal observation and monitoring).

Ongoing Activities

Beaver Management: There is a trapping moratorium on beavers on the Ochoco National Forest which has been in effect since 1993. This has helped populations re-establish in a few areas.

Maintenance of exclosures: No measurable effect to soils for maintenance activities. When maintained these exclosures will help reduce the effect of hooves of large herbivores in the inside of the exclosure areas.

Roading: Currently the net amount of road in this watershed area is approximately 1,820 miles including both system and non-system roads.

Road Maintenance: Ongoing road maintenance activities would continue. This includes activities such as cleaning culverts and ditches, installing drain dips, blading road surfaces, and replacing road signs. Road maintenance has short term effects to soils but helps reduce the magnitude of long term impacts.

Firewood cutting:. The firewood synopsis specifies no cutting within riparian habitat conservation areas. Cutting is currently limited to within 600 feet of designated roads. Localized impacts may continue that are associated with illegal firewood cutting and the proliferation of user created firewood cutting roads.

ATV/OHV use: This is an ongoing use largely during hunting season. Wet season use in the spring for turkey hunting, antler hunting, and mushroom hunting has been shown to contribute to erosion and delivered sediment in localized areas. Off road travel is limited to within 300 feet of open routes to access dispersed camping sites except where otherwise designated open.

Invasive Plant Treatments: Most invasive plant treatments occur along roads and in rock pits. Given the limited extent of treatment this has no measurable effect on soils. Soils along Forest roads and the highway are often mixtures of subsoil, aggregate, cobble, stone and cinders. Such treatments help reduce colonization of undesirable plant species, many of which limit the re-colonization of disturbed sites by desirable natives or native cultivars.

Fences and Water Developments**:** Fences and water developments are maintained via ATV or pickups sometimes with 2 track trails along the fence lines and to springs, troughs and ponds. There are approximately 126 water developments located on ONF managed lands in the Ochoco Summit OHV project area. These comprise springs, troughs and ponds. Each water development includes approximately one acre of land immediately adjacent to the development that has detrimentally impacted soils associated with livestock use of the development. Impacts include compacted, displaced, post holed/plugged and exposed soils. These areas are generally denuded of vegetation. The estimated extent of detrimentally impacted soils associated with the existing developments is approximately 126 acres.

There are about 225 miles of fenceline in the project area**.** Primary impacts are associated with the use of motorized vehicles ranging from OHVs to pickups to transport materials from roads to the site of the construction. Soil compaction and displacement would be limited to areas where vehicles were driven. Assuming a 10-foot wide "road," one mile of fence would result in approximately 1.2 acres of soil experiencing detrimental soil impacts. 225 miles of fence translates into (225 mi x 1.2 ac/mi= 270 acres).

Decommission/Obliterated Roads: Treatment can involve removing culverts, removal of fills from the flood plain, reestablishment of stream channels to their "natural" contour, surface scarification or deep ripping and sub-soiling, water barring and ditch removal. It also may include such thing as removal of unstable fills, insloping or outsloping of the roadbed to improve slope hydrology; and distribution of an erosion seed mix, fertilizer, and weed-free straw to protect soils from surface erosion. A decommissioned road is "storm proofed" or we might say it is "hydrologically obliterated," even though the landscape is not restored or recontoured to near original shape.

Decommissioning or obliteration of roads can affect soils. Short term erosion may increase depending on future storm events, but long term erosion from the road surface and ditches would be reduced. Infiltration would be enhanced through tillage and runoff would be reduced. Trees and other vegetation would recolonize these sites.

Effects of Proposed Activities in Combination with Effects from Past, Present and Reasonably Foreseeable Actions

Refer to Table 54 for miles of proposed trail and estimate of acres impacted under each alternative. The proposed alternatives increase the amount of area exposed to soil disturbance. However, at the landscape scale the increase is relatively small in comparison to the existing level of disturbance across the project area. The magnitude of this increase is described for each alternative below in relationship to the level of disturbance that has resulted from development of the existing network of roads, including both system and non-system road beds.

Alternative 1: OHV travel would proceed as currently allowed, restricted to designated mixed use roads as displayed on the MVUM maps. OHV use on existing roads is only 5.5 percent of the total 1,820 miles (3,312 acres = 1.1 percent) of road in the approximately 301,000acre analysis area. The miles of route legally open for travel by OHV would not change under this alternative.

Alternative 2: Since the OHVs would largely be restricted to existing disturbance (i.e. existing road prisms), impacts would be limited (170 total miles, ca 237 acres, of which, 69 miles are new trails, ca 32 acres). Initial trail construction disturbance would have a short term effect that would largely be unmeasurable at the landscape scale due to the large project area acreages involved. For example, of the total 170 miles of proposed OHV trails, 101 miles are on existing disturbance. OHV use on existing roads is only 5.5 percent of the total 1,820 miles (3,312 acres = 1.1 percent) of road in the approximately 301,000acre analysis area. The proposed new trail construction adds 69 miles or 32 acres. These new trails add only 3.8 percent to the total 1,820 miles of roads and trails. Total existing

and roads and trail acreage impacts would be increased by only 0.01 percent across this project area (1.10% to 1.11%).

Alternative 3: Since the OHVs would largely be restricted to existing disturbance (i.e. existing road prisms), impacts would be limited (101 total miles, ca 88 acres, of which, 50 miles are new trails, ca 18 acres). Initial trail construction disturbance would have a short term effect that would largely be unmeasurable at the landscape scale due to the large project area acreages involved. For example, of the total 101 miles of proposed OHV trails, 51 miles are on existing disturbance. OHV use on existing roads is only 2.8 percent of the total 1,820 miles (3,312 acres = 1.1 percent) of road in the approximately 301,000 acre analysis area. The proposed new trail construction adds 50 miles or 18 acres. These new trails add only 2.7 percent to the total 1,820 miles of roads and trails. Total existing and roads and trail acreage impacts would be increased by less than 0.01 percent across this project area (1.10% to 1.108%).

Alternative 4: Since the OHVs would largely be restricted to existing disturbance (i.e. existing road prisms), these impacts would be limited (212 total miles, ca 173 acres, of which, 81 miles are new trails, ca 38 acres). Initial trail construction disturbance would have a short term effect that would largely be unmeasurable at the landscape scale due to the large project area acreages involved. For example, of the total 212 miles of proposed OHV trails, 131 miles are on existing disturbance. OHV use on existing roads is 7.2 percent of the total 1,820 miles (3,312 acres = 1.1 percent) of road in the ca. 300,548 total project acreage. The proposed new trail construction adds 81 miles or 38 acres. These new trails add 4.5 percent to the total 1,820 miles of roads and trails. Total existing and roads and trail acreage impacts would be increased by about 0.01 percent across this project area (1.10% to 1.11%).

Hydrology

Pertinent Rules and Regulations

Water Quality

Direction for managing water quality, water quantity, and riparian areas on the Ochoco National Forest are found in the Forest Service Manual, Title 2500 - Watershed and Air Management (FSM 1984), Forest Service Inland Native Fish Strategy Environmental Assessment (INFISH 1995), Environmental Assessment for the Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH 1995), Code of Federal Regulations (36 CFR 219), National Best Management Practices for Water Quality Management on National Forest System Lands (USDA 2012), General Water Quality Best Management Practices (BMP 1988), the Clean Water Act (CWA 1972), Executive Orders 11988, 11990 and 12088, the Organic Administration Act of 1897, and the Ochoco National Forest Land Resource and Management Plan (LRMP 1989).

Goals are generalized statements that provide broad direction for future management of the Forest. Objectives represent projected, potential outputs in support of overall goals and are based on available inventory data and assumptions. Desired future conditions summarize the anticipated physical changes that are likely to occur as a result of carrying out planned management practices over time.

Goals of the Ochoco National Forest include:

- Maintain or improve water quality, quantity, and timing of run-off.
- Comply with the objectives of the “Clean Water Act” and State of Oregon water quality standards.
- Provide water of consistently high quality to users and dependent resources.

Objectives of the Ochoco National Forest include:

- Maintenance or improvement of water quality through the proper management of entire watersheds at all times, with special attention given to riparian areas.
- Maintain or improve all riparian areas to "excellent condition".
- Water quantity reflects the surface water leaving the Forest as a result of natural run-off and any increased run-off expected to result from the manipulation of vegetation. Year to year variations in precipitation are likely to obscure any increase or decrease in run-off resulting from management activities.

Desired future condition of the Ochoco National Forest includes:

- In ten years, individual watersheds on the Forest that are currently in excellent condition are expected to remain so and those not presently in good condition will be given first priority for improvement.
- Fifty years and beyond, it is expected that 90 to 95 percent of the riparian areas on the Forest will be in "excellent condition" by the year 2040. No significant increases in run-off for the Forest are expected.

Management Area Prescriptions - Riparian

A management area is composed of lands with similar capabilities or characteristics, and is allocated to emphasize a particular resource or mix of resources. In conjunction with Forest-wide standards and guidelines, management areas provide a site-specific management emphasis and desired future condition for that area.

Riparian areas include land adjacent to water, where plants that are dependent on a perpetual source of water occur. They normally have high water tables and soils which exhibit characteristics of wetness. Riparian areas provide food, cover, and a source of large woody material for aquatic insects, fish and land animals. The vegetation of streamside areas filter sediment and shade the water surface to help maintain stable stream temperatures.

Management emphasis for riparian areas includes:

- Manage streamside vegetation and habitat to maintain or improve water quality. Meet temperature and turbidity levels as required by state standards under the Clean Water Act.

Desired future condition for riparian areas includes:

- Exhibiting a low, but apparent level of management. Vegetation may or may not appear manipulated, depending on the condition of the stream. Suitable amounts of large woody material will be apparent within the riparian area to provide streambank stability and habitat.
- For management purposes, a special protection area (100 feet from the edges of perennial bodies of water) will be apparent.
- Within the limits of ecological potential, a shady, brushy condition with a canopy of alder, willow, aspen, or other deciduous vegetation will exist.
- Where coniferous evergreens are a natural component of the ecosystem, a variety of size classes will exist to perpetuate the supply of shade and woody debris over time. Sites unable to support a canopy of deciduous or evergreen species will be characterized by vigorous stands of forbs, grasses, and grass-like riparian species.
- Bank slopes containing high plant densities, thick root masses, embedded angular boulders, and old logs will also characterize these areas. Extensive scouring of streambanks will be an uncommon occurrence as will soil deposition outside the norm for the individual stream system. Streambeds will be commonly covered by native aquatic growth on assorted sizes of rocks and boulders.
- Where cobble and gravel bars are prominent, they will become covered by sandy loam soils as riparian vegetation filters and traps stream sediments. As stream banks are rebuilt and

cutbanks stabilized, a narrower, deeper channel will gradually develop.

- Springs and wet meadows are not specifically included in this management area prescription, but should receive appropriate protection as stated in Forest-Wide Standards and Guidelines for Water.

Forest-Wide Standards and Guidelines – Water

Standards and guidelines state the bounds or constraints within which all practices are to be carried out in achieving the planned goals, objectives and desired future conditions. They are intended to supplement, but do not replace, policy direction found in Forest Service Manuals and Handbooks, and the Regional Guide for the Pacific Northwest Region. They also must comply with applicable State and Federal laws and regulations.

Water Quality

Comply with State requirements in accordance with the Clean Water Act for protection of waters of the State of Oregon (Oregon Administrative Rules, Ch. 340-041-0001), through planning, application, and monitoring of Best Management Practices (BMP 1988, USDA 2012) in conformance with the Clean Water Act, regulations, and federal guidelines issued thereto.

Floodplains and Wetlands (including springs and wet meadows)

Consider the presence of, and potential impacts to, any inventoried floodplain in project area environmental analysis.

Do not locate major structures, roads, or other facilities within floodplains unless no feasible alternative sites exist outside floodplain.

Allow projects causing short-term impacts on floodplain values only if specific mitigation measures designed to minimize the impacts are documented in the project environmental analysis. Restore natural floodplain characteristics after the activity has ceased.

See Management Area F15 Riparian for emphasis and desired future condition of riparian as a management area prescription (not including springs and wet meadows), and management area standards and guidelines for desired resource areas, such as Fire, Recreation, Timber, Transportation System, and Water.

Management Area Standards and Guidelines, Resource – Water

Temperature – Standard and Guideline

The requirements for shade along streams will generally correspond to provisions for more than 80 percent of the surface shaded. Where this can not be attained, 100 percent of the potential for shade is the standard.

Shade requirements may be reduced in cases where management is necessary to sustain a thrifty community of shade providing species over time, but activities may not result in an increase in termperatures above the limits specified (MA-F15 Riparian).

Turbidity – Standard and Guideline

Allow no more than 10 percent cumulative increase in stream turbidity. Short-term (less than five days) deviations from this standard to accommodate emergency or other legitimate activities will comply with state requirements for notification and approval (MA-F15 Riparian).

Project Activities – Standard and Guideline

Special attention shall be given to land and vegetation for approximately 100 feet from the edges of all perennial streams, lakes, and other bodies of water. This area shall correspond to at least the recognizable area dominated by the riparian vegetation. No management practices causing

detrimental changes in water temperature or chemical composition, blockages, or deposits of sediment which seriously and adversely affect water conditions or fish habitat shall be permitted within these areas.

Give preferential consideration to riparian-dependent resources over other resources in cases of unresoluble conflicts.

Vegetation and ground cover requirements:

- Where site potential and topographic factors permit, manage riparian areas to provide the shade necessary to meet stream temperature goals.
- Maintain upper streambanks in a stable condition along at least 80 percent of the length of a stream.
- Retain at least 80 percent of the potential ground cover in grass-forb riparian communities. Also, retain at least 80 percent of the potential tree or shrub cover in riparian areas dominated by trees or shrubs. In riparian areas with mixed layers, the cover requirement may be met by taking credit for the effective cover provided by all vegetative layers of the riparian community including shrubs, tree understories, and the dominant overstory. Consider the mitigating effect of stream size and orientation as well as surrounding topography when determining the amount of cover that may be removed.

The Clean Water Act (CWA 1972)

The objective of the Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of all waters to protect the Beneficial Uses as documented according to criteria by the Oregon Department of Environmental Quality (ODEQ 2010). A beneficial use is a resource or activity that would be directly affected by a change in water quality or quantity.

To help implement the objectives of the Clean Water Act, Oregon has developed and adopted water quality standards. Water quality standards include beneficial uses, narrative and numeric criteria, and antidegradation policies. Standards are designed to protect the most sensitive beneficial use within a water body. A determination that water quality is impaired can be based on: evidence of a numeric criterion exceedance; evidence of a narrative criterion exceedance; evidence of a beneficial use impairment; or evidence of a declining trend in water quality such that it would exceed a standard prior to the next listing period (ODEQ 2010).

Executive Orders

The following Executive Orders pertain to this project:

Executive Order 12088 requires Federal compliance with pollution control standards (i.e. the Clean Water Act).

Executive Order 11988 requires agencies to avoid adverse impacts associated with the occupancy and modification of floodplains.

Executive Order 11990 requires agencies to avoid adverse impacts associated with the destruction or modification of wetlands.

PACFISH/ INFISH

PACFISH

PACFISH provides interim direction to protect habitat and populations of anadromous fish habitat in eastern Oregon, eastern Washington, Idaho, western Montana, and portions of Nevada. There are no anadromous fish species or habitat in the Ochoco Summit Planning Area Subwatersheds that contain proposed trail locations. No further evaluation will be discussed as PACFISH does not apply to the Ochoco Summit Planning Area.

INFISH

INFISH provides direction to protect habitat and populations of resident native fish outside of anadromous fish habitat in eastern Oregon, eastern Washington, Idaho, western Montana, and portions of Nevada. For the Ochoco Summit Planning Area, INFISH provides protection for redband trout.

Riparian Management Objectives for Redband Trout

Riparian Management Objectives (RMOs) describing good habitat were developed to describe desired condition for fish habitat. Table 55 is taken from Table A-1: Interim Riparian Management Objectives (RMOs) from INFISH (1995).

Table 55. Riparian Management Objectives (INFISH 1995).

Habitat Feature	Interim Objective
Pool Frequency (all systems)	Varies by channel width
Water Temperature	No measurable increase in maximum water temperature (7-day moving average of daily maximum temperature measured as the average of the maximum daily temperature of the warmest consecutive 7-day period). Maximum water temperatures below 59F within adult holding habitat and below 48F within spawning and rearing habitats.
Large Woody Debris (forested systems)	East of Cascade Crest in Oregon, Washington, Nevada, Idaho, Nevada and western Montana: >20 pieces per mile; >12 inch diameter; >35 foot length
Bank Stability (non-forested systems)	>80 percent stable.
Lower Bank Angle (non-forested systems)	>75 percent of banks with <90 degree angle (i.e., undercut)
Width/Depth Ratio (all systems)	<10, mean wetted width divided by mean depth

Analysis Design

Watersheds within the Project Boundary that were not Analyzed

Subwatersheds that do not contain streams that are within 300 feet of proposed trails were not analyzed for effects to hydrology. Table 56 lists the subwatersheds that were not analyzed and their Hydrologic Unit Codes (HUC). The current maps of proposed trail locations for Alternatives 3 and 4 indicate that the trail locations extend to within 300 feet of perennial tributary to Duncan Creek; however, based on the location of the proposed trail determined from aerial photography, the trail would not actually extend into the Duncan Creek Subwatershed. The Duncan Creek Subwatershed was, therefore, removed from this hydrology analysis.

Table 56. Name and HUCs for subwatersheds not analyzed within the Ochoco Summit project boundary.

Field	Area	Name	Hydrologic Unit Code
1st	Region	Pacific Northwest	17
2nd	Sub-region	Middle Columbia River	1707
3rd	River Basin	John Day River	170702
4th	Sub-basin	Upper John Day River	17070201
5th	Watershed	Mountain Creek	1707020113
6th	Subwatershed	Upper Mountain Creek	170702011301
		Middle Mountain Creek	170702011302
5th	Watershed	Rock Creek	1707020114
6th	Subwatershed	Upper Rock Creek	170702011401
		Middle Rock Creek	170702011402
4th	Sub-basin	Lower John Day River	17070204
5th	Watershed	Bridge Creek	1707020403
6th	Subwatershed	West Branch Bridge Creek	170702040302
3rd	River Basin	Deschutes River	170703
4th	Sub-basin	Beaver-South Fork	17070303
5th	Watershed	Paulina Creek	1707030309
6th	Subwatershed	Upper Paulina Creek	170703030901
		Dry Paulina Creek	170703030902
5th	Watershed	Lower Beaver Creek	1707030310
6th	Subwatershed	Wolf Creek	170703031002
		Drift Canyon	170703031004
4th	Sub-basin	Upper Crooked River	17070304
5th	Watershed	Upper North Fork Crooked River	1707030403
6th	Subwatershed	Gray Creek	170703040301
		Headwaters North Fork Crooked River	170703040305
5th	Watershed	Lower North Fork Crooked River	1707030405
6th	Subwatershed	Lower North Fork Canyon	170703040502
4th	Sub-basin	Lower Crooked River	17070305
5th	Watershed	Upper Ochoco Creek	1707030502
6th	Subwatershed	Headwaters Ochoco Creek	170703050201
		Lower Marks Creek	170703050204
		Duncan Creek	170703050205

Potential Issues Acknowledged but not Analyzed

The following potential issues are briefly discussed, but for reasons described were not considered further in this analysis:

- **Contamination of Surface or Groundwater** from chemicals potentially released at staging areas (e.g. petroleum, bacteria, nutrients). Only one staging area is located within 300 feet of a perennial stream channel in the Ochoco Summit Planning Area, Ochoco Divide Snow Park. This existing Snow Park staging area, proposed for Alternatives 2, 3 and 4 as an OHV staging area, is located just under 300 feet from Marks Creek where the creek transitions from intermittent to perennial; the Snow Park is already in use. The staging area is not located within the RHCA, and there is a relatively low risk of contamination from the staging area affecting water quality. No proposed staging areas are within wetland RHCAs, as described by INFISH RHCA requirements and based on Potential Natural Vegetation wetland vegetation type locations. In addition, project design criteria direct that “All fuel-powered

vehicles and tools would be refueled at least 75 feet from any live stream." None of the streams within the project area is listed by Oregon Department of Environmental Quality on the 303(d) list for any contaminants other than stream temperature.

- **Stream Temperature** - Within the project area there are several streams with assessed water quality impairments related to summer water temperature. These include Double Corral Creek, Fox Creek, Happy Camp Creek, Howard Creek, Indian Creek, Jackson Creek, Little Summit Creek, Marks Creek, North Wolf Creek, Ochoco Creek, Peterson Creek, Porter Creek, and Toggle Creek. These streams are on Oregon's 2004/2006 Section 303(d) List of "Water Quality Limited Waterbodies." The Oregon State Water Quality Standards states that the seven-day-average maximum temperature of a stream identified as having salmon and trout rearing and migration use, which describes some streams within the project area, may not exceed 18.0 degrees Celsius (64.4 degrees Fahrenheit). No measurable increase in water temperature from management practices is allowed in these streams. In order to address potential stream temperature effects from trail construction in the Ochoco Summit OHV Project Area, design criteria are included that prevent the removal of shade producing trees on streams on the 303(d) list for water temperatures. Any exceptions would be reviewed on a case-by-case basis by a fisheries biologist or hydrologist. These design criteria will prevent a reduction of shade on streams in the project area, resulting in no increase in stream temperatures.
- **Tight Curves** – Recent studies conducted by the Forest Service and the Department of Transportation found that "compared to tight-radius curves, nearly eight times as many passes were required to produce equal impacts on straight sections, and nearly five times as many passes were required for uphill and downhill sections" of all-terrain vehicle (ATV) trails (Meadows et al. 2008). In order to address potential erosion and subsequent sediment delivery to streams, design criteria were included that require locating curves less than 45 degrees outside of the stream sediment delivery zone.

Methods

Stream Surveys

Bottom Line Surveys (BLS) were conducted between 1991 and 2001 on the Ochoco National Forest perennial and intermittent streams to determine if a streamside management unit was in compliance with the riparian zone standards and guidelines. These surveys included measurements of shade, large woody debris, cutbanks, and pools.

Level II Stream Surveys were conducted between 1989 and 2011 on the Ochoco National Forest perennial streams to identify existing riparian and aquatic ecosystem conditions on a basin-wide scale.

Sediment/Turbidity

Environmental effects of unstable streambanks include increased turbidity and sediment yield, development of cutbanks, and changes in channel morphology. The result of these changes may result in water quality conditions that are lethal to aquatic organisms. Changes in channel morphology would primarily be seen with changes in entrenchment, width-to-depth ratios, and ultimately channel type (Rosgen 2009). Streams with unstable banks typically erode laterally (i.e. become wider and shallower), which increases the width-to-depth ratio. See sections titled "Geology" and "Soils" in Chapter 3 of this document for additional descriptive information on soil erosion, channel erosion, bank erosion, and overland flow from compaction and/or displacement.

Turbidity is the degree to which suspended material in the water impedes light penetration. Turbidity is expressed in Nephrometric Turbidity Units (NTUs). There can be a close correlation between

turbidity and suspended sediment in a given stream, but the correlation can change as organic material increases over the summer or if the percent of sediment from different sources in the drainage changes. The correlation is poor in sediment-limited systems. Turbidity is not a good indicator of the amount of sediment being transported as bedload. At turbidity levels above 25 NTU salmonid sight-feeding may be reduced. Most measurable effects to aquatic life result from sediment instead of turbidity.

State water quality standards direct that turbidity levels should not exceed background levels by more than 10 percent. There is no quantitative standard for sediment in the Oregon DEQ water quality rules. The Narrative Criteria section (340-041-0007-12) states that activities can not result in the formation of appreciable organic or inorganic deposits deleterious to fish or other aquatic life; however, this is more of an objective than a standard. The state appears to be using turbidity as a surrogate for sediment.

Studies have generally concluded that non-channelized sediment flow rarely travels more than 300 feet and that 200-300 foot riparian "filter strips" are generally effective at protecting streams from sediment from non-channelized flow (INFISH 1995, Belt et al. 1992). As a general rule the closer a ground disturbing activity is to a stream, including stream crossings, the higher the potential for sediment delivery.

Soil disturbance on ridges or side slopes may never affect water quality, but disturbance of a channel bed or bank is immediately reflected in downstream sediment levels. Unstable stream banks associated with mechanical disturbance, loss of vegetative root strength, decreases in roughness associated with large woody material (LWM) and vegetation removal, or channelized stream banks are highly susceptible to changes in flow or sediment load. Unstable stream banks can account for most of the sediment load in a drainage system. If the discharge and/or the sediment load are substantially increased, the flow may erode the streambanks or deposit sediment to reach a new equilibrium. A high incidence of raw banks (i.e. cutbanks), headcuts, and/or braided channels (Rosgen channel type D) are indicative of unstable stream banks.

A recent study conducted by the USFS and the US Department of Transportation Federal Highway Administration assessed to what degree natural resources are being effected by all-terrain-vehicle (ATV) use (Meadows et al. 2008). This study found that "following any level of disturbance, runoff and sediment generated on the ATV trails increased by 56 percent and 625 percent, respectively, compared to the undisturbed forest floor." In addition, the study found that tight-radius curves result in the most trail disturbance condition, followed by uphill and downhill sections of trail, with straight sections of trails receiving the least disturbance and susceptibility to rutting (Meadows et al. 2008).

Bank Stability

Measured cutbank percentages of stream survey reaches were used to assess the existing condition of bank stability for streams in the Ochoco Summit Project Area. Each measurement factor was given a good, fair, or poor rating based on measured values. Percent cutbank was estimated and summarized from the most recent Level II and Bottom Line Survey data for each stream reach. Good ratings indicate that cutbanks are meeting Forest Plan Standards (i.e. <20 percent), fair condition indicate cutbanks between 20 and 29 percent, and a poor rating is associated with cut banks of greater than 30 percent.

Slope Erosion Hazard

The Ochoco National Forest Slope Erosion Hazard Layer was used to assess the susceptibility of the soils to erosion within each Ochoco Summit Project Area subwatershed. Percentages of high, moderate and low slope erosion hazard were determined within 300 feet of perennial and intermittent streams within each subwatershed. Subwatersheds with greater than 30% of the area within 300 feet of perennial and intermittent streams with a high slope erosion hazard were considered high, with

more than 25% with a low slope erosion hazard were given a rating of low, and the remaining subwatersheds with a majority of the area within a moderate hazard rating were considered moderate.

Roads/Trails

Existing road densities within 300 feet of perennial and intermittent streams in the Ochoco Summit Project Area were used to assess the existing condition of roads located within the sediment delivery zone. Only non-paved roads with operational maintenance levels designated as Level I through V were considered for this analysis as potential sediment sources for sediment delivery to streams within the Ochoco Summit Project Area. Closed roads (Level I) were included in the analysis, since road closures typically consist of installing a blockage of some sort at the road entrance to prevent use rather than hydrologically stabilizing the road. Closed roads, therefore, can still contribute sediment to stream channels. For purposes of alternative analysis, densities of proposed trails were added to existing roads to determine overall road/trail densities within 300 feet of perennial and intermittent streams. Each measurement factor was given a low, moderate, or high rating. A road/trail density within the 300 feet of streams with less than six miles per square mile was considered to be low, between six and seven miles per square mile was considered moderate, and greater than seven miles per square mile was considered high. Measurement factor ratings were then summarized into a single roads/trails rating for existing condition.

Channel Sensitivity and Recovery Potential

Varying stream forms and systems react differently to disturbance and recover at differing rates. Depending upon the geomorphic variables, such as entrenchment and bankfull width and depth, one stream may more resilient and may recover more quickly than another when exposed to disturbance. Stream channels with similar geomorphic variables react similarly to disturbances. In order to assess the existing condition and the potential effects on the stream channels in the Ochoco Summit Project Area, the streams were classified and rated accordingly based on their Rosgen Channel Type. This stream classification system, developed by Rosgen, classifies streams into stream types based on entrenchment ratios, width/depth ratios, sinuosity, channel gradient, and channel material (1996).

The width-to-depth ratio is an index of the cross-sectional channel shape, where both width and depth are measured at the bankfull level. Changes in discharge, bank stability, sediment load and/or bedload can rapidly alter the width and/or depth of the channel. Whether a stream erodes downward or outward or both can be influenced by bank shear stress, channel substrate type and the amount of riparian vegetation present on stream banks. Bank vegetation increases the resistance to erosion through its binding effects on banks, with erosion decreasing as the percentage of roots in the soil increases.

The entrenchment ratio is defined by Rosgen (1996) as the flood-prone area width divided by the bankfull width. Flood-prone area width is the width of the stream at twice maximum bankfull depth. Entrenched streams are typically vertically confined (within cutbanks) due to vertical channel erosion and have entrenchment ratios that are less than 1.4 (see Figure 1); higher entrenchment ratios indicate that channels are not confined and have access to floodplain. G and F-type channels are entrenched.

Channel disturbances such as increased sediment supply, excessive bank erosion, or increased flows can result in stream channel instability by upsetting the balance between sediment inputs and outputs. Increased sediment supply may result in channel aggradation, whereas excessive bank erosion typically results in channel widening. Both aggradation and channel widening change the ability of a stream channel to transport sediment downstream and may lead to a change in stream channel type.

A stream channel’s sensitivity to disturbance is related to the channel type and the dominant channel material (Rosgen 2009). In general, finer-grained channel material results in a more sensitive stream channel, with the exception of clay, which can in some circumstances increase channel stability somewhat (Rosgen 2009). Finer grained (gravels and smaller) A, C, D, E, F, and G channels range

from high to extreme sensitivity to disturbance (Table 57). Finer grained B and DA channel types, however, are expected to have moderate sensitivity to disturbance. Other channel stability factors based on channel type include recovery potential, sediment supply, streambank erosion potential, and vegetation controlling influence. When these factors depart significantly from their stable state, it can result in degradation, aggradation, accelerated lateral erosion, avulsion or other channel instability. Ultimately, these instability consequences can lead to a change in channel type and a change in channel sensitivity as well as the other channel stability factors (Rosgen 2009).

In order to evaluate the potential impacts to streams in the Ochoco Summit project area, the sensitivity to disturbance and the recovery potential were evaluated by stream type within the analysis subwatersheds (Table 57). Descriptive ratings for sensitivity to disturbance ranging from very low to extreme were quantified from one to six, respectively. Descriptive ratings for recovery potential ranging from excellent to very poor were quantified from one to six, respectively. These numerical scores were then added together based on the channel type to assess the overall sensitivity and recovery potential for each evaluated stream reach, which were then given a condition rating of poor for scores between 10 to 12, fair for scores between five and nine, and good for scores between two and four. This overall rating was then used to determine the potential of disturbance from the Ochoco Summit Project alternatives to affect the stream channels in the vicinity of proposed trail locations based on stream channel type.

Table 57. Generalized sensitivity to disturbance and recovery potential by stream type (Rosgen 2009).

Stream Type	Sensitivity to Disturbance	Recovery Potential	Overall Score	Overall Rating
A1	Very Low (1)	Excellent (1)	2	Good
A2	Very Low (1)	Excellent (1)	2	Good
A3	Very High (5)	Very Poor (6)	11	Poor
A4	Extreme (6)	Very Poor (6)	12	Poor
A5	Extreme (6)	Very Poor (6)	12	Poor
A6	High (4)	Poor (5)	9	Fair
B1	Very Low (1)	Excellent (1)	2	Good
B2	Very Low (1)	Excellent (1)	2	Good
B3	Low (2)	Excellent (1)	3	Good
B4	Moderate (3)	Excellent (1)	4	Good
B5	Moderate (3)	Excellent (1)	4	Good
B6	Moderate (3)	Excellent (1)	4	Good
C1	Low (2)	Very Good (2)	4	Good
C2	Low (2)	Very Good (2)	4	Good
C3	Moderate (3)	Good (3)	6	Fair
C4	Very High (5)	Good (3)	8	Fair
C5	Very High (5)	Fair (4)	9	Fair
C6	Very High (5)	Good (3)	8	Fair
D3	Very High (5)	Poor (5)	10	Poor
D4	Very High (5)	Poor (5)	10	Poor
D5	Very High (5)	Poor (5)	10	Poor
D6	High (4)	Poor (5)	9	Fair
DA4	Moderate (3)	Good (3)	6	Fair
DA5	Moderate (3)	Good (3)	6	Fair
DA6	Moderate (3)	Good (3)	6	Fair
E3	High (4)	Good (3)	7	Fair
E4	Very High (5)	Good (3)	8	Fair
E5	Very High (5)	Good (3)	8	Fair
E6	Very High (5)	Good (3)	8	Fair
F1	Low (2)	Fair (4)	6	Fair

Table 57. Generalized sensitivity to disturbance and recovery potential by stream type (Rosgen 2009).

Stream Type	Sensitivity to Disturbance	Recovery Potential	Overall Score	Overall Rating
F2	Low (2)	Fair (4)	6	Fair
F3	Moderate (3)	Poor (5)	8	Fair
F4	Extreme (6)	Poor (5)	11	Poor
F5	Very High (5)	Poor (5)	10	Poor
F6	Very High (5)	Fair (4)	9	Fair
G1	Low (2)	Good (3)	5	Fair
G2	Moderate (3)	Fair (4)	7	Fair
G3	Very High (5)	Poor (5)	10	Poor
G4	Extreme (6)	Very Poor (6)	12	Poor
G5	Extreme (6)	Very Poor (6)	12	Poor
G6	Very High (5)	Poor (5)	10	Poor

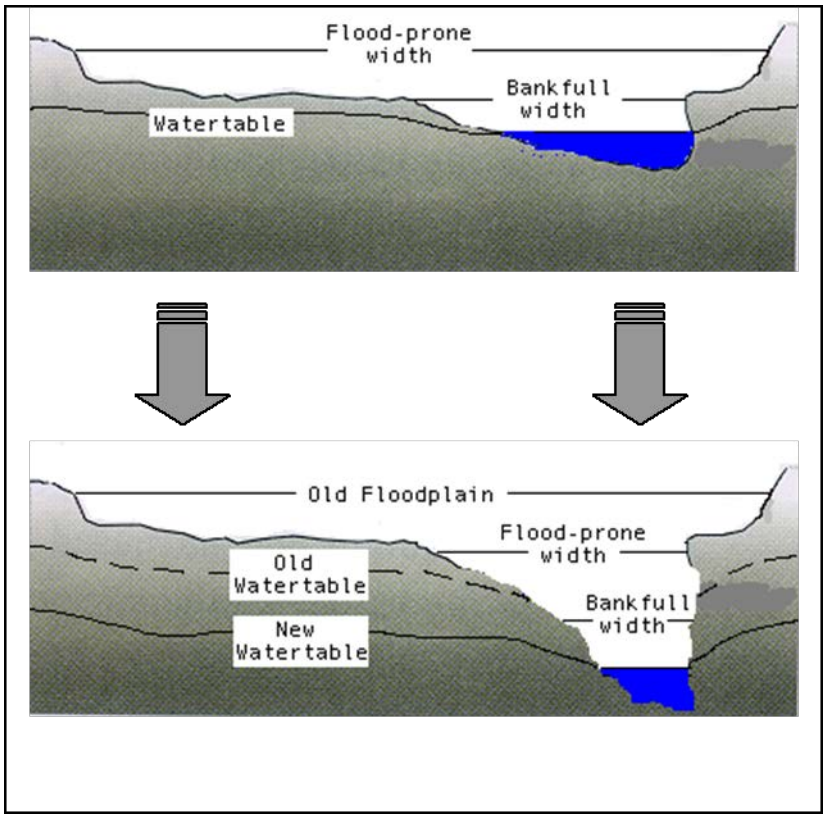


Figure 1. Changes in channel morphology and water table elevation associated with entrenchment.

Groundwater Dependant Ecosystems

Groundwater Dependant Ecosystems (GDE) include wet meadows, springs, fens, and other wetlands that are dependent on groundwater. These systems not only provide essential habitat for wildlife, but also are the source of substantial portions of streamflow, particularly during baseflow conditions in the late summer and fall. Protection of GDEs maintains habitat and protects water quality.

INFISH interim guidance designates an RHCA buffer of 150 feet around a wetland greater than one acre and 50 feet around a wetland that is smaller than one acre in non-priority watersheds. No watersheds within the Ochoco National Forest are designated as Priority Watersheds according to the INFISH designation.

In order to analyze the existing condition and the potential effects of the Ochoco Summit Proposed Action and the alternatives on GDEs, the existing road density and the proposed trail density were estimated within wetlands, wet meadows, and springs along with the appropriate RHCAs. A 50 foot RHCA was used for wetlands and wet meadows smaller than one acre and springs. For wetlands or wet meadows greater than one acre in size, a 150 foot RHCA was used. These values were summarized by subwatershed and given a rating of low, moderate, or high. A road/trail density of less than six miles per square mile was considered low, between six and seven miles per square mile was considered moderate, and greater than seven miles per square mile was considered high. Departure from existing condition could then be evaluated.

Flow and Sediment Regimes

Roads have the potential to increase the drainage density of a stream network by intercepting runoff at stream crossings or by channelizing flow that would otherwise be sheet flow or groundwater flow (Wemple at al. 1996; Jones et al. 2000; Takken et al. 2008). By increasing the drainage density and providing a more direct route to stream channels, roads in effect can decrease the time it takes for the precipitation, in the form of runoff, to enter the stream channel and potentially resulting in increased peak flows (La March and Lettenmaier 2001; Storck et al. 1998; Woldie et al. 2009). In addition, since erosion risk from ATV trails has been shown to potentially equal that of a forest road network, it can be expected that trails have the potential to increase drainage densities and peak flows similar to forest roads (Meadows et al., 2008). Areas with high road densities, high drainage densities, and a high density of stream crossings typically result in higher connectivity of the road and stream network. The effects of roads (or trails) on increased peak flows is expected to be greatest downstream of areas with a high density of stream crossings (Jones et al., 2000).

In order to address potential effects of trail construction to the flow and sediment regimes within the Ochoco Summit Project Area, the existing condition of road densities, drainage densities, and intermittent and perennial stream crossing densities were estimated and rated relative to one another for each analysis subwatershed.

Road Density

Road densities were determined for the existing condition by estimating the total miles of Operational Maintenance Level 1-5 Roads within the analysis subwatershed and dividing this length my the total drainage area of the subwatershed in square miles. These values for road densities were then given a rating of low, moderate, or high. Low for the lowest third of road densities (<3.5 miles per square mile) for the analysis subwatersheds, moderate for the middle third (3.4-4 miles per square mile), and high for the highest third (> 4 miles per square mile). Closed roads (Level I) were included in the analysis, since road closures typically consist of installing a blockage of some sort at the road entrance to prevent use rather than stabilized hydrologically. Closed roads, therefore, can still contribute sediment to stream channels. For alternative analysis, trail lengths were added to road miles, to determine the overall road/trail densities. These values were then rated using the same values as for the road density existing condition. Departure from existing condition could then be evaluated.

Drainage Density

Drainage densities were determined for the existing condition by estimating the total miles of intermittent and perennial streams within the analysis subwatershed and dividing this length by the total drainage area of the subwatershed in square miles. These values for drainage densities were then

given a rating of low, moderate, or high. Low for the lowest third of road densities (<2.2 miles per square mile) for the analysis subwatersheds, moderate for the middle third (2.2-2.5 miles per square mile), and high for the highest third (> 2.5 miles per square mile).

Stream Crossing Density

The existing condition relative to stream crossing density was determined by dividing the total number of intermittent and perennial stream crossings by the drainage area in square miles. Each of these factors was given a low, moderate, or high rating based on the number of crossings per subwatershed drainage area. Based on the overall ranges, subwatersheds with more than 3.5 crossings per square mile of drainage area were considered high, between 2.5 and 3.5 crossings per square mile were considered moderate, and less than 2.5 crossings per square miles were considered low. To analyze the Ochoco Summit Proposed Action and the alternatives, the number of new trail stream crossings and the number of existing road/stream crossings per subwatershed drainage area were assessed relative to the stream channel's existing condition, channel type, and flow-regime. Ratings for the alternative analysis were based on the same values as for existing condition. Departure from existing condition could then be evaluated.

Existing Condition

Watersheds

The Ochoco Summit project area includes all or portions of nine watersheds and 31 subwatersheds (see Map 9). Watersheds and subwatersheds that do not contain streams that are within 300 feet of proposed trails were not analyzed as part of this analysis. Subwatersheds that were not analyzed are listed in the Analysis Design section. Nine subwatersheds were analyzed, comprising all or portions of four watersheds: Lower Beaver Creek, Upper North Fork Crooked River, Deep Creek, and Upper Ochoco Creek. The ten subwatersheds intersected by the project area include North Fork Wolf Creek, Elliot Creek, Howard Creek, Peterson Creek, Porter Creek, Jackson Creek, Little Summit Prairie Creek, Lower Deep Creek, and Upper Marks Creek. Hydrologic Unit Codes (HUC), which break drainage systems into progressively smaller areas, and drainage names within the project area are listed in Table 58. Map 10 displays the project area RHCAs.

Table 58. Hydrologic Unit Codes for the Ochoco Summit project area.

Field	Area	Name	Hydrologic Unit Code
1st	Region	Pacific Northwest	17
2nd	Sub-region	Middle Columbia River	1707
3rd	River Basin	Deschutes River	170703
4th	Sub-basin	Beaver-South Fork	17070303
5th	Watershed	Lower Beaver Creek	1707030310
6th	Subwatershed	North Wolf Creek	170703031001
4th	Sub-basin	Upper Crooked River	17070304
5th	Watershed	Upper North Fork Crooked River	1707030403
6th	Subwatershed	Elliot Creek	170703040302
		Howard Creek	170703040303
		Peterson Creek	170703040306
		Porter Creek	170703040307
5th	Watershed	Deep Creek	1707030404
6th	Subwatershed	Jackson Creek	170703040401
		Little Summit Prairie Creek	170703040402
		Lower Deep Creek	170703040403
4th	Sub-basin	Lower Crooked River	17070305
5th	Watershed	Upper Ochoco Creek	1707030502
6th	Subwatershed	Upper Marks Creek	170703050203

Streams

Table 59 lists the named streams by watershed and subwatershed within the Ochoco Summit project area. The project area includes all streams in the Deep Creek Watershed and only some of the streams in the other three watersheds. However, the Upper North Fork Crooked River Watershed encompasses a majority of the named streams within the project area, followed by the Deep Creek Watershed, the Upper Ochoco Creek Watershed, and finally the Lower Beaver Creek Watershed. Proposed trail stream crossings are only across a select number of the streams within the project area (see Table 59).

Streams within the Ochoco Summit project area have a dendritic drainage pattern with approximately 476 miles of mapped streams with defined channels (Class I – IV) within the analysis subwatersheds (Table 60). There are approximately 138 miles of fish bearing streams (Class I-II) within the analysis subwatersheds. Table 6 lists the lengths of streams by stream class within the project area summarized by watershed and subwatershed. Definitions of stream class are described in the section titled "Aquatic Species" in Chapter 3 of this document.

For the purposes of this analysis, only Class I, II, III, or IV streams are considered functional streams. Class V (or VIIII) streams are ephemeral draws that do not have established beds and banks and often are covered with vegetation. Ephemeral streams do not routinely transport sediment except during larger precipitation events.

Table 59. List of streams in the Ochoco Summit project area by watershed and subwatershed*.

Watershed	Subwatershed	Streams			
Lower Beaver Creek	North Wolf Creek	*North Wolf Cr*		Widow Cr	
Upper North Fork Crooked River	Elliot Creek	*Crosswhite Cr*	*Elliot Cr*	*Fox Cr*	*Indian Cr*
		Shady Cr	*Stump Cr*	*West Fork Fox Cr*	
	Howard Creek	East Fork Howard Cr		*Howard Cr*	Merritt Cr
		South Fork Howard Cr		West Fork Howard Cr	
	Peterson Creek	*Allen Cr*	*Beetle Cr*	*Peterson Cr*	Ross Cr
		Yellow Jacket Cr			
	Porter Creek	*Dry Porter Cr*	*East Porter Cr*		*Looney Cr*
		Porter Cr		Stupid Cr	
Deep Creek	Jackson Creek	*Cabbage Cr*	Deep Cr	*Derr Cr*	Dicer Cr
		Double Corral Cr		*Happy Camp Cr*	
		Haypress Cr	Hypress Cr	*Jackson Cr*	*Toggle Cr*
	Little Summit Prairie Creek	*Little Summit Cr*	Thornton Cr	West Fork Thornton Cr	
	Lower Deep Creek	*Big Spring Cr*	*Buck Hollow*	*Crazy Cr*	*Deep Cr*
		East Fork Crazy Cr		*West Fork Crazy Cr*	
Upper Ochoco Creek	Upper Marks Creek	Buck Cr	*Crystal Cr*	Deadman Cr	Marks Cr
		Long Hollow Cr		Nature Cr	*Rush Cr*
*Italicized streams have stream crossings proposed for at least one of the alternatives.					

Class I, fish-bearing streams within the Ochoco Summit Analysis Subwatersheds include Allen Creek, Deep Creek, Elliot Creek, Fox Creek, Jackson Creek, Little Summit Creek, Marks Creek, the East Fork of Allen Creek, the North Fork Crooked River, Ochoco Creek, Peterson Creek and Toggle Creek. Approximately three quarters of fish-bearing streams in the analysis subwatersheds are located in Upper North Fork Crooked River and Deep Creek Watersheds.

Table 60. Stream class miles by watershed and subwatershed.

Watershed	Subwatershed	Class I	Class II	Class III	Class IV	Total
Lower Beaver Creek	North Wolf Creek	-	6.9	5.9	27.2	40.0
Upper North Fork Crooked River	Elliot Creek	1.6	10.5	5.8	28.5	46.5
	Howard Creek	-	10.7	11.3	11.2	33.3
	Peterson Creek	11.2	5.9	6.2	36.4	59.7
	Porter Creek	0.01	11.0	2.7	29.3	43.0
Deep Creek	Jackson Creek	6.4	17.9	4.7	39.3	68.3
	Little Summit Prairie Creek	4.3	8.1	3.3	37.8	53.5
	Lower Deep Creek	7.9	6.1	11.7	20.5	46.3
Upper Ochoco Creek	Upper Marks Creek	6.1	10.8	11.4	15.5	43.9
Total Stream Miles		37.6	88.0	63.0	245.8	434.4

The perennial streams equate to Forest Service Class I through Class III streams. Class I and II streams may, however, be intermittent if they are used by fish part of the year. Flow regime (i.e. perennial, intermittent, and ephemeral) characteristics for the subwatersheds in the project area are summarized in Table 61. Overall, streams in the Ochoco Summit project area are dominated by intermittent streams. A majority of the perennial streams are located within the Upper North Fork Crooked River and the Deep Creek Watersheds, with approximately 46 miles and 47 miles of perennial streams within the analysis subwatersheds, respectively.

Table 61. Miles of perennial, intermittent, and ephemeral streams.

Watershed	Subwatershed	Perennial	Intermittent	Ephemeral	Total
Lower Beaver Creek	North Wolf Creek	3.2	36.8	-	40.0
Upper North Fork Crooked River	Elliot Creek	12.6	33.9	6.8	53.2
	Howard Creek	7.7	24.6	5.1	37.5
	Peterson Creek	19.5	39.4	20.6	79.5
	Porter Creek	6.4	36.6	14.8	57.7
Deep Creek	Jackson Creek	28.6	39.7		68.3
	Little Summit Prairie Creek	5.3	48.1	-	53.5
	Lower Deep Creek	13.3	32.9	-	46.3
Upper Ochoco Creek	Upper Marks Creek	20.3	23.6	5.2	49.1
Total Stream Miles		117.0	315.7	52.5	485.1

Sediment/Turbidity

Bank Stability

Accelerated erosion that has caused sediment inputs into streams within the Ochoco National Forest has also negatively affected the success of redband populations. Spawning habitats are negatively affected by the introduction of fine sediments from erosion. Sedimentation degrades spawning gravels and spawning success. Channel stability and the ability of the channel to transport the flows and sediment of its watershed effectively is another important component of quality salmonid habitat.

Of the total length of stream surveyed in the Ochoco Summit project area subwatersheds, approximately four percent of the streams have no identified cutbanks. Approximately 83 percent of the surveyed stream reach lengths are in good condition (<20 percent cutbank), 14 percent are in fair condition (20-30 percent cutbank), and three percent are in poor condition (>30 percent cutbank). Poor bank stability is found in the upper reaches of North Wolf Creek and the upper reaches of

Peterson Creek. Overall fair bank stability conditions are found in the middle reach of North Wolf Creek, the middle reaches of Allen Creek, and the middle reach of Porter Creek.

Slope Erosion Hazard

A combination of slope and soil characteristics within 300 feet of perennial and intermittent streams in the Ochoco Summit project area, as reflected in the Slope Erosion Hazard Rating, indicate an overall moderate erosion hazard. The area within 300 feet of perennial and intermittent streams in the Ochoco Summit project area subwatersheds are dominated by moderate slope erosion hazard conditions, ranging from 54% to 87%. North Wolf Creek and Elliot Creek Subwatersheds have the highest percentage of high slope erosion hazard conditions with 40% and 33% of the area within 300 feet of perennial and intermittent streams, respectively. Porter Creek Subwatershed has the highest percentage of area, namely 26%, in the vicinity of streams dominated by low slope erosion hazard conditions.

Roads/Trails

Road densities in much of the forest are higher in the vicinity of streams than averaged over the entire subwatershed due to the topographic characteristics of the stream drainages. Existing road densities within 300 feet of perennial and intermittent streams within the Ochoco Summit project area subwatersheds range from 4.3 to 8.2 miles per square mile. The highest road densities in the vicinity of the streams within the project area are found in the Howard Creek, Porter Creek, Little Summit Prairie Creek, and Upper Marks Creek Subwatersheds. North Wolf Creek and Jackson Creek Subwatersheds have moderate road densities near streams, ranging from 6.1 to 6.3 miles per square mile. The lowest road densities within 300 feet of streams can be found in the Lower Deep Creek, Elliot Creek, and Peterson Creek Subwatersheds.

Channel Sensitivity and Recovery Potential

Streams with sufficient survey data within the analysis subwatersheds are dominated by C channel types and the dominant channel material is gravel. Based on Table 57, C4 channel types have a very high sensitivity to disturbance and a good recovery potential. Second to C channel types within the analysis subwatersheds are B channel types also dominated by gravel. Based on Table 57, B4 channel types have a moderate sensitivity to disturbance and an excellent recovery potential.

Groundwater-Dependent Ecosystems

Existing road densities within springs and wetlands and their associated RHCAs are between 2.8 and 9.9 miles per square mile. Porter Creek and Lower Deep Creek Subwatersheds have relatively high road densities in the vicinity of GDEs with road densities of 9.9 and 7.6 miles per square mile, respectively. Howard Creek, North Wolf Creek, and Upper Marks Creek Subwatersheds have more moderate existing road densities ranging from 6.6 to 6.9 miles per square mile. Subwatersheds with relatively low road densities in the vicinity of GDEs within the Ochoco Summit project area include Jackson Creek, Peterson Creek, Little Summit Prairie Creek, and Elliot Creek.

Flow and Sediment Regimes

Road Density

Existing watershed wide Operational Maintenance Level 1-5 road densities range from 3.0 miles per square mile in Lower Deep Creek Subwatershed to 4.6 in Howard Creek Subwatershed. Howard Creek and Upper Marks Creek have relatively high road densities, ranging from 4.1 to 4.6. Road densities in Jackson Creek, Little Summit Prairie Creek, North Wolf Creek, and Porter Creek Subwatersheds are relatively moderate. Elliot Creek, Lower Deep Creek, and Peterson Creek Subwatersheds have relatively low road densities, ranging from 3.0 to 3.3 miles per square mile.

Drainage Density

Drainage densities based on the existing intermittent and perennial Forest Service GIS data layer range from 1.8 to 2.9. Elliot Creek, North Wolf Creek, Peterson Creek, and Porter Creek Subwatersheds all have relatively high drainage densities, ranging from 2.7 to 2.9. Howard Creek and Upper Marks Creek Subwatersheds have relatively moderate drainage densities of 2.2 and 2.4, respectively. Jackson Creek, Little Summit Prairie Creek, and Lower Deep Creek have the lowest drainage densities in the Ochoco Summit project area, ranging from 1.8 to 2.1.

Stream Crossings

The number of existing road/stream crossings per subwatershed drainage area within forest boundaries ranges from 1.8 to 5.0 number of crossings per square mile. The highest number of stream crossings per square mile is located in the Upper Marks Creek, Howard Creek, and Porter Creek Subwatersheds and range from 4.0 to 5.0. Elliot Creek, North Wolf Creek, Peterson Creek, and Little Summit Prairie Creek Subwatersheds have a moderate number of existing stream crossings per square mile, ranging from 2.5 to 3.4. The least number of existing stream crossings per square mile are found in Lower Deep Creek and Jackson Creek Subwatersheds.

Watershed and Subwatershed Descriptions

Lower Beaver Creek Watershed

Class III trails are proposed to be located in the headwaters portion of the Lower Beaver Creek Watershed as part of the Ochoco Summit Project. Though the trail does intersect the very upper portions of the Wolf Creek Subwatershed along the ridge, only the North Wolf Creek Subwatershed encompasses streams that are within 300 feet, the sediment delivery zone, of proposed trails. Table 62 summarizes the existing condition within the North Wolf Creek Subwatershed based on identified potential hydrologic effects to the sediment, turbidity and the flow and sediment regimes in and near the streams within the project area.

Based on measured bank stability, slope erosion hazard, road densities near streams, channel sensitivity and recovery potential, and the density of roads in and near wetlands, the streams within the Lower Beaver Creek Watershed are identified as being in relatively fair condition for sediment and turbidity, with poor slope erosion hazard conditions and moderate road densities through the North Wolf Creek Subwatershed. The best conditions are found in the Widow Creek drainage. Based on overall road density, drainage density, and stream crossing density in North Wolf Creek and Widow Creek, the flow and sediment regime conditions are relatively poor to fair.

Table 62. Summary of existing condition in the Lower Beaver Creek Watershed.

Subwatershed	Sediment/Turbidity	Flow/Sediment Regime
North Wolf Creek	Fair	Poor/Fair
* Status/Condition - All variables meeting standards = good; Some variables meeting standards = fair; Most or all variables not meeting standards = poor; No Data Collected (ND)		

North Wolf Creek Subwatershed

Three drainages flow out of the forest and leave the forest boundary within the North Wolf Creek Subwatershed. North Wolf Creek is the western-most drainage and is a perennial, fish-bearing stream with multiple intermittent tributaries. At the forest boundary, the no-name stream east of North Wolf Creek is an intermittent, fish-bearing stream and Widow Creek, the eastern-most drainage, is a perennial, non-fish-bearing stream.

Table 63 summarizes the existing condition of streams for the two hydrologic issues identified for analysis within the North Wolf Creek Subwatershed. Based on stream surveys and existing Forest Service data layers, the North Wolf Creek Subwatershed was found to have poor slope erosion hazard

conditions and moderate road density conditions within 300 feet of perennial and intermittent streams. In addition, this subwatershed was found to have moderate stream crossing densities, moderate road densities within GDEs and the associated RHCA, and moderate overall road densities. The overall drainage density is relatively high, which equates to a poor condition for the purposes of the potential for impact from roads and trails. North Wolf Creek was found to have fair bank stability, very high channel sensitivity, and good recovery potential. Widow Creek was found to have good bank stability, moderate channel sensitivity, and excellent recovery potential.

Table 63. Summary of stream condition and impairments in North Wolf Creek Subwatershed.

Stream	Sediment/Turbidity					Flow/Sediment Regime		
	Bank Stability	Slope Erosion Hazard	Road Density w/in 300' of Streams	Channel Sensitivity/ Recovery Potential	GDE	Road Density	Drainage Density	Stream Crossing Density
North Wolf	Fair	High	Moderate	Fair	Moderate	Moderate	High	Moderate
Widow	Good			Good				
Overall	Fair/Good	Poor	Fair	Fair/Good	Fair	Fair	Poor	Fair

Upper North Fork Crooked River Watershed

Trails are proposed across the northern portion of the Upper North Fork Crooked River Watershed as part of the Ochoco Summit Project. These proposed trail locations intersect portions of the Elliot Creek, Howard Creek, Peterson Creek, and Porter Creek Subwatersheds. Table 64 summarizes the existing condition within the Upper North Fork Crooked River Watershed based on identified potential hydrologic effects to the sediment, turbidity and the flow and sediment regimes in and near the streams within the project area.

Based on measured bank stability, slope erosion hazard, road densities near streams, channel sensitivity and recovery potential, and the density of roads in and near wetlands, the streams within the Upper North Fork Crooked River Watershed are identified as being in relatively fair condition for sediment and turbidity. The best conditions relative to sediment and turbidity issues exist in the Peterson Creek Subwatershed with low road density conditions near streams and wetlands. Based on overall road density, drainage density, and stream crossing density in the Upper North Fork Crooked River Watershed, the flow and sediment regime conditions are relatively poor fair, with Elliot and Peterson Creek Subwatersheds having the best conditions within the watershed.

Table 64. Summary of existing condition in the Upper North Fork Crooked River Watershed.

Subwatershed	Sediment/Turbidity	Flow/Sediment Regime
Elliot Creek	Fair	Fair
Howard Creek	Fair	Poor
Peterson Creek	Good	Fair
Porter Creek	Fair	Poor
Overall	Fair	Poor/Fair
* Status/Condition - All variables meeting standards = good; Some variables meeting standards = fair; Most or all variables not meeting standards = poor; No Data Collected (ND)		

Elliot Creek Subwatershed

Elliot Creek Subwatershed drains into the north end of Big Summit Prairie and includes Crosswhite Creek, Elliot Creek, Fox Creek, Indian Creek, Shady Creek, Stump Creek, West Fork of Fox Creek, and other unnamed stream channels. Perennial fish-bearing streams include Indian Creek, Fox Creek, and Elliot Creek. Crosswhite Creek, Stump Creek, and multiple unnamed streams are intermittent streams where they cross the forest boundary into Big Summit Prairie.

Table 65 summarizes the existing condition of streams for the two hydrologic issues identified for analysis within the Elliot Creek Subwatershed. Pertinent stream survey data only exist for Fox Creek within the Elliot Creek Subwatershed, therefore, bank stability and stream channel types were only determined for this stream. The other indicators (i.e. Slope Erosion Hazard, Road Densities, etc.) were estimated for all perennial, intermittent streams, and identified GDEs within the subwatershed. Based on stream surveys and existing Forest Service data layers, the Elliot Creek Subwatershed was found to have poor slope erosion hazard conditions and low road density conditions within 300 feet of perennial and intermittent streams. In addition, this subwatershed was found to have low road densities within GDE RHCAs. Fox Creek was found to have good bank stability through the surveyed stream reaches and extreme channel sensitivity and poor recovery potential based on the channel type at the proposed stream crossing location. Based on the dominant channel type throughout the entire stream network, however, Fox Creek overall has a moderate channel sensitivity and an excellent recovery potential. Overall road density existing conditions are good, drainage densities are relatively high, which equates to a poor condition relative to roads, and the stream crossing density existing conditions is relatively fair.

Table 65. Summary of stream condition and impairments in Elliot Creek Subwatershed.

Stream	Sediment/Turbidity					Flow/Sediment Regime		
	Bank Stability	Slope Erosion Hazard	Road Density w/in 300' of Streams	Channel Sensitivity/ Recovery Potential	GDE	Road Density	Drainage Density	Stream Crossing Density
Fox	Good	High	Low	Poor	Low	Low	High	Moderate
Overall	Good	Poor	Good	Poor	Good	Good	Poor	Fair

In 2006, a wildfire called the Maxwell Fire affected approximately 2,317 acres in Allen Creek, East Fork Allen Creek, and Elliot Creek drainages. Potential sedimentation in stream reaches within and below moderate to high severity burn areas were identified as values at risk within Allen Creek, East Fork Allen Creek, and Elliot Creek (BAER 2006). Erosion during snow melt runoff during the spring of 2007 added to the loss of filtering vegetation from the wildfire in RHCAs along Allen Creek, East Fork Allen Creek, and Elliot Creek. Roads were closed and culverts were pulled to reduce erosion and sediment delivery to streams. Specifically, culverts were removed and outlsoped drain dips were installed on FR2200-500, FR2200-550, and FR2200-505 (BAER 2006).

Howard Creek Subwatershed

Elliot Creek Subwatershed drains into the northwest corner of Big Summit Prairie and includes East Fork Howard Creek, Howard Creek, Merritt Creek, South Fork Howard Creek, West Fork Howard Creek, and other unnamed stream channels. Perennial fish-bearing streams include Howard Creek and East Fork Howard Creek. South Fork Howard Creek and West Fork Howard Creek are intermittent fish-bearing streams. Merritt Creek and multiple unnamed tributaries to Howard Creek are intermittent, non-fish-bearing streams.

Table 66 summarizes the existing condition of streams for the two hydrologic issues identified for analysis within the Howard Creek Subwatershed. Based on stream surveys and existing Forest Service data layers, the Howard Creek Subwatershed was found to have fair slope erosion hazard conditions and high road density conditions within 300 feet of perennial and intermittent streams. In addition, this subwatershed was found to have fair road densities within GDEs and the associated RHCAs. East Fork Howard Creek, Howard Creek, South Fork Howard Creek, and West Fork Howard Creek were all found to have good bank stability through the surveyed portion of stream. With the exception of East Fork Howard Creek, the streams within the Howard Creek Subwatershed have good overall channel sensitivity/recovery potential conditions. Based on the channel type

derived from stream survey field measurements, East Fork Howard Creek is expected to have very high channel sensitivity to disturbance and a good recovery potential. In addition, this subwatershed was found to have poor stream crossing density, poor road density, and fair drainage density.

Table 66. Summary of stream condition and impairments in Howard Creek Subwatershed.

Stream	Sediment/Turbidity					Flow/Sediment Regime		
	Bank Stability	Slope Erosion Hazard	Road Density w/in 300' of Streams	Channel Sensitivity/ Recovery Potential	GDE	Road Density	Drainage Density	Stream Crossing Density
East Fork Howard	Good	Moderate	High	Fair	Moderate	High	Moderate	High
Howard	Good			Good				
South Fork Howard	Good			Good				
West Fork Howard	Good			Good				
Overall	Good	Fair	Poor	Fair/Good	Fair	Poor	Fair	Poor

Peterson Creek Subwatershed

Peterson Creek Subwatershed drains into the northeast corner of Big Summit Prairie and includes Allen Creek, Beetle Creek, Peterson Creek, East Fork Allen Creek, Ross Creek, Yellow Jacket Cr, and other unnamed stream channels. Perennial fish-bearing streams include Allen Creek, East Fork Allen Creek, Beetle Creek, and Peterson Creek. Ross Creek is a perennial non-fish-bearing stream. Yellow Jacket Creek and multiple unnamed tributaries to Peterson Creek are intermittent, non-fish-bearing streams.

Table 67 summarizes the existing condition of streams for the two hydrologic issues identified for analysis within the Peterson Creek Subwatershed. Based on stream surveys and existing Forest Service data layers, the Peterson Creek Subwatershed was found to have fair slope erosion hazard conditions and low road density conditions within 300 feet of perennial and intermittent streams. In addition, this subwatershed was found to have good road densities within GDEs and associated RHCAs. East Fork Allen Creek was found to have good bank stability through the surveyed portion of stream, however, Allen Creek and Peterson were found to have fair bank stability. Five of the six reaches surveyed in Peterson Creek in 2006 and 2007 were found to have good bank stability, only the upper most reach was found to have poor bank stability with greater than 20 percent cutbanks. Based on the channel type derived from stream survey field measurements, all three streams are expected to have very high channel sensitivity to disturbance and a good recovery potential. In addition, this subwatershed has fair stream crossing density, good road density, and poor drainage density existing conditions.

The Maxwell Fire (2006) affected approximately 2,317 acres in Allen Creek, East Fork Allen Creek, and Elliot Creek drainages. Potential sedimentation in stream reaches within and below moderate to high severity burn areas were identified as values at risk within Allen Creek, East Fork Allen Creek, and Elliot Creek (BAER 2006). Erosion during snow melt runoff during the spring of 2007 added to the loss of filtering vegetation from the wildfire in RHCAs along Allen Creek, East Fork Allen Creek, and Elliot Creek. Roads were closed and culverts were pulled to reduce erosion and sediment delivery to streams. Specifically, culverts were removed and outlsoped drain dips were installed on FR2200-500, FR2200-550, and FR2200-505 (BAER 2006).

Table 67. Summary of stream condition and impairments in Peterson Creek Subwatershed.

Stream	Sediment/Turbidity					Flow/Sediment Regime		
	Bank Stability	Slope Erosion Hazard	Road Density w/in 300' of Streams	Channel Sensitivity/ Recovery Potential	GDE	Road Density	Drainage Density	Stream Crossing Density
East Fork Allen	Good	Moderate	Low	Fair	Low	Low	High	Moderate
Allen	Fair			Fair				
Peterson	Fair			Fair				
Overall	Fair	Fair	Good	Fair	Good	Good	Poor	Fair

Porter Creek Subwatershed

Porter Creek Subwatershed flows into the Lower Big Summit Prairie Subwatershed, which drains into the east side of Big Summit Prairie and includes Dry Porter Creek, East Porter Creek, Looney Creek, Porter Creek, Stupid Creek, and other unnamed stream channels. Perennial fish-bearing streams include portions of Porter Creek and East Porter Creek. There are no perennial non-fish-bearing streams in the Porter Creek Subwatershed. Looney Creek is an intermittent fish-bearing stream. Stupid Creek, Dry Porter Creek, and multiple unnamed tributaries to Porter Creek are intermittent, non-fish-bearing streams.

Table 68 summarizes the existing condition of streams for the two hydrologic issues identified for analysis within the Porter Creek Subwatershed. Based on stream surveys and existing Forest Service data layers, the Porter Creek Subwatershed was found to have good slope erosion hazard conditions and high road density conditions within 300 feet of perennial and intermittent streams. In addition, this subwatershed was found to have poor road densities within identified GDEs and the associated RHCAs. East Porter Creek was found to have good bank stability through the surveyed portion of stream, however, Porter Creek was found to have fair bank stability. Based on the channel type derived from stream survey field measurements, Porter Creek is expected to have moderate channel sensitivity to disturbance and an excellent recovery potential. Based on its dominant channel type, East Porter Creek is expected to have moderate channel sensitivity to disturbance and a good recovery potential; however, based on the channel type at the stream crossing, the stream channel at that location is expected to have a low channel sensitivity and excellent recovery potential. In addition, this subwatershed has poor stream crossing density, fair road density, and poor drainage density existing conditions.

Table 68. Summary of stream condition and impairments in Porter Creek Subwatershed.

Stream	Sediment/Turbidity					Flow/Sediment Regime		
	Bank Stability	Slope Erosion Hazard	Road Density w/in 300' of Streams	Channel Sensitivity/ Recovery Potential	GDE	Road Density	Drainage Density	Stream Crossing Density
East Porter	Good	Good	High	Fair/Good	High	Moderate	High	High
Porter	Fair			Good				
Overall	Fair/Good	Good	Poor	Fair/Good	Poor	Fair	Poor	Poor

Deep Creek Watershed

Deep Creek is a focus watershed as defined by the Forest Service Region 6 Aquatic Restoration Strategy. Proposed restoration projects were identified in the Deep Creek Restoration Plan, some of which have already been implemented (see section titled "Cumulative Effects" in Chapter 3 of this document for more information).

Trails are proposed across the landscape of the Deep Creek Watershed, from lower elevation to upper elevations, as part of the Ochoco Summit Project. These proposed trail locations intersect portions of the Jackson Creek, Little Summit Prairie Creek, and Lower Deep Creek Subwatersheds. Table 69 summarizes the existing condition within the Deep Creek Watershed based on identified potential hydrologic effects to the sediment, turbidity and the flow and sediment regimes in and near the streams within the project area.

Based on measured bank stability, slope erosion hazard, road densities near streams, channel sensitivity and recovery potential, and the density of roads in and near wetlands, the streams within the Deep Creek Watershed are identified as being in relatively fair to good condition for sediment and turbidity. These proposed trail locations intersect portions of the Jackson Creek, Little Summit Prairie Creek, and Lower Deep Creek Subwatersheds.

Table 69. Summary of existing condition in the Deep Creek Watershed.

Subwatershed	Sediment/Turbidity	Flow/Sediment Regime
Jackson Creek	Fair/Good	Good
Little Summit Prairie Creek	Fair/Good	Fair/Good
Lower Deep Creek	Fair/Good	Good
Overall	Fair/Good	Good
* Status/Condition - All variables meeting standards = good; Some variables meeting standards = fair; Most or all variables not meeting standards = poor; No Data Collected (ND)		

Jackson Creek Subwatershed

Jackson Creek Subwatershed flows into the Lower Deep Creek Subwatershed and includes Cabbage Creek, Derr Creek, Dicer Creek, Double Corral Creek, Happy Camp Creek, Haypress Creek, Hypress Creek, Jackson Creek, Toggle Creek, and other unnamed stream channels. Perennial fish-bearing streams include Jackson Creek, Double Corral Creek, Toggle Creek, Dicer Meadow Creek, Derr Creek, and an unnamed tributary to Jackson Creek. Cabbage Creek is the only perennial non-fish-bearing stream in the Jackson Creek Subwatershed. Hypress Creek, Haypress Creek, and multiple unnamed tributaries to Jackson Creek are intermittent, non-fish-bearing streams.

Table 70 summarizes the existing condition of streams for the two hydrologic issues identified for analysis within the Jackson Creek Subwatershed. Based on stream surveys and existing Forest Service data layers, the Jackson Creek Subwatershed was found to have fair slope erosion hazard conditions and fair road density conditions within 300 feet of perennial and intermittent streams. In addition, this subwatershed was found to have low road densities within identified GDE and the associated RHCAs. Both Happy Camp Creek and Jackson Creek were found to have good overall bank stability for the surveyed reaches of stream. Based on the channel type derived from stream survey field measurements, both streams are expected to have very high channel sensitivity to disturbance and good recovery potential. In addition, this subwatershed has good stream crossing density, fair road density, and good drainage density relative to potential effects to peak flows from connectivity of roads and streams.

Table 70. Summary of stream condition and impairments in Jackson Creek Subwatershed.

Stream	Sediment/Turbidity					Flow/Sediment Regime		
	Bank Stability	Slope Erosion Hazard	Road Density w/in 300' of Streams	Channel Sensitivity/ Recovery Potential	GDE	Road Density	Drainage Density	Stream Crossing Density
Happy Camp	Good	Fair	Moderate	Fair	Low	Moderate	Low	Low
Jackson	Good			Fair				
Overall	Good	Fair	Fair	Fair	Good	Fair	Good	Good

Little Summit Prairie Creek Subwatershed

Little Summit Prairie Creek Subwatershed flows in a westerly direction into the Lower Deep Creek Subwatershed and includes Little Summit Creek, Thornton Creek, West Fork Thornton Creek, and other unnamed stream channels. Little Summit Prairie Creek is the only perennial fish-bearing stream in the Little Summit Prairie Creek Subwatershed. There are no perennial non-fish-bearing streams in the Little Summit Prairie Creek Subwatershed. Thornton Creek, West Fork Thornton Creek, and an unnamed tributary to Little Summit Creek are intermittent, fish-bearing streams in the subwatershed. Multiple unnamed tributaries to Jackson Creek consist of intermittent, non-fish-bearing streams.

Table 71 summarizes the existing condition of streams for the two hydrologic issues identified for analysis within the Little Summit Prairie Creek Subwatershed. Based on stream surveys and existing Forest Service data layers, the Little Summit Prairie Creek Subwatershed was found to have fair slope erosion hazard conditions and high road density conditions within 300 feet of perennial and intermittent streams. In addition, this subwatershed was found to have low road densities within GDEs and the associated RHCAs. Little Summit Creek was found to have good overall bank stability for the surveyed reaches of stream. Based on the channel type derived from stream survey field measurements at the proposed stream crossing location, Little Summit Creek at this location is expected to have low channel sensitivity to disturbance and excellent recovery potential. Based on the dominant stream channel type over the entire surveyed stream reaches, however, the channel sensitivity is expected to be very high with a good recovery potential. In addition, this subwatershed has fair stream crossing density, fair road density, and good drainage density existing conditions relative to potential effects to peak flows from connectivity of roads and streams.

Table 71. Summary of stream condition and impairments in Little Summit Prairie Creek Subwatershed.

Stream	Sediment/Turbidity					Flow/Sediment Regime		
	Bank Stability	Slope Erosion Hazard	Road Density w/in 300' of Streams	Channel Sensitivity/ Recovery Potential	GDE	Road Density	Drainage Density	Stream Crossing Density
Little Summit Prairie	Good	Fair	High	Fair/Good	Low	Moderate	Low	Moderate
Overall	Good	Fair	Poor	Fair/Good	Good	Fair	Good	Fair

Lower Deep Creek Subwatershed

Lower Deep Creek is a priority subwatershed as defined by the Forest Service Watershed Condition Framework Process. Lower Deep Creek Subwatershed flows into the Lower North Fork Crooked River Subwatershed just downstream of the confluence of the North Fork Crooked River and Porter Creek. The Lower Deep Creek Subwatershed encompasses Big Spring Creek, Buck Hollow, Crazy Creek, Deep Creek, East Fork Crazy Creek, West Fork Crazy Creek, and other unnamed stream channels. Deep Creek, Crazy Creek, and Big Springs Creek are perennial fish-bearing stream in the

Lower Deep Creek Subwatershed. There are two unnamed perennial non-fish-bearing streams that are tributaries to Deep Creek and Big Springs Creek in the Lower Deep Creek Subwatershed. East Fork Crazy Creek is an intermittent, fish-bearing stream and West Fork Crazy Creek, Buck Hollow and multiple unnamed tributaries to Deep Creek are intermittent, non-fish-bearing streams in the Lower Deep Creek Subwatershed.

Table 72 summarizes the existing condition of streams for the two hydrologic issues identified for analysis within the Lower Deep Creek Subwatershed. Based on stream surveys and existing Forest Service data layers, the Lower Deep Creek Subwatershed was found to have fair slope erosion hazard conditions and low road density conditions within 300 feet of perennial and intermittent streams. In addition, this subwatershed was found to have high road densities within identified GDEs and the associated RHCAs. Within the surveyed reaches of both streams, they were found to have good overall bank stability. Based on the channel type derived from stream survey field measurements, Deep Creek is expected to have very high channel sensitivity to disturbance and good recovery potential, while Crazy Creek is expected to have moderate channel sensitivity and excellent recovery potential. In addition, this subwatershed has good stream crossing density, good road density, and good drainage density existing conditions relative to potential effects to peak flows from connectivity of roads and streams.

Table 72. Summary of stream condition and impairments in Lower Deep Creek Subwatershed.

Stream	Sediment/Turbidity					Flow/Sediment Regime		
	Bank Stability	Slope Erosion Hazard	Road Density w/in 300' of Streams	Channel Sensitivity/ Recovery Potential	GDE	Road Density	Drainage Density	Stream Crossing Density
Crazy	Good	Fair	Low	Good	High	Low	Low	Low
Deep	Good			Fair				
Overall	Good	Fair	Good	Fair/Good	Poor	Good	Good	Good

Upper Ochoco Creek Watershed

Trails are proposed across the northeastern portion of the Upper Ochoco Creek Watershed as part of the Ochoco Summit Project. These proposed trail locations intersect portions of the Upper Marks Creek and Headwaters Ochoco Creek Subwatersheds; however, trails are not proposed within 300 feet of mapped streams within the Headwaters Ochoco Creek Subwatershed. Table 73 summarizes the existing condition within the Upper Ochoco Creek Watershed based on identified potential hydrologic effects to the sediment, turbidity and the flow and sediment regimes in and near the streams within the project area.

Based on measured bank stability, slope erosion hazard, road densities near streams, channel sensitivity and recovery potential, and the density of roads in and near wetlands, the streams within the Upper Ochoco Creek Watershed are identified as being in relatively fair condition for sediment and turbidity. Based on overall road density, drainage density, and stream crossing density in Crystal Creek and Marks Creek, the flow and sediment regime conditions are relatively poor.

Table 73. Summary of existing condition in the Upper Ochoco Creek Watershed.

Subwatershed	Sediment/Turbidity	Flow/Sediment Regime
Upper Marks Creek	Fair	Poor
Overall	Fair	Poor
* Status/Condition - All variables meeting standards = good; Some variables meeting standards = fair; Most or all variables not meeting standards = poor; No Data Collected (ND)		

Upper Marks Creek Subwatershed

The Ochoco Summit Project Boundary follows along Marks Creek and divides the subwatershed into a northwest portion that is outside of the project boundary and a southeast portion that is within the project boundary. Upper Marks Creek Subwatershed flows into the Lower Marks Creek Subwatershed just upstream of the confluence of the Marks Creek and Little Hay Creek. The Upper Marks Creek Subwatershed within the project boundary encompasses Buck Creek, Crystal Creek, Deadman Creek, Marks Creek, Long Hollow Creek, Nature Creek, Rush Creek, and other unnamed stream channels. Marks Creek, Rush Creek, Deadman Creek, Crystal Creek, and unnamed tributaries to both Marks Creek and Crystal Creek are perennial fish-bearing streams in the Upper Marks Creek Subwatershed within the project boundary. There are two unnamed perennial non-fish-bearing streams that are tributaries to Crystal Creek in the Upper Marks Creek Subwatershed. Long Hollow Creek is an intermittent, fish-bearing stream and Buck Creek and multiple unnamed tributaries to Marks Creek are intermittent, non-fish-bearing streams in the Upper Marks Creek Subwatershed. Only approximately 200 feet of stream at the mouth of Buck Creek is included within the Ochoco Summit Project Boundary.

Table 74 summarizes the existing condition of streams for the two hydrologic issues identified for analysis within the Upper Marks Creek Subwatershed. Based on stream surveys and existing Forest Service data layers, the Upper Marks Creek Subwatershed was found to have fair slope erosion hazard conditions and moderate road density conditions within 300 feet of perennial and intermittent streams. In addition, this subwatershed was found to have moderate road densities within identified GDEs and the associated RHCAs. Within the surveyed reaches of both Crystal Creek and Marks Creek, they were found to have good overall bank stability. Based on the channel type derived from stream survey field measurements, Marks Creek and Crystal Creek are expected to have very high channel sensitivity to disturbance and good recovery potential. In addition, this subwatershed has poor stream crossing density, poor road density, and fair drainage density existing conditions relative to potential effects to peak flows from connectivity of roads and streams.

Table 74. Summary of stream condition and impairments in Upper Marks Creek Subwatershed.

Stream	Sediment/Turbidity					Flow/Sediment Regime		
	Bank Stability	Slope Erosion Hazard	Road Density w/in 300' of Streams	Channel Sensitivity/ Recovery Potential	GDE	Road Density	Drainage Density	Stream Crossing Density
Crystal	Good	Fair	Moderate	Fair	Moderate	High	Moderate	High
Marks	Good			Fair				
Overall	Good	Fair	Fair	Fair	Fair	Poor	Fair	Poor

Environmental Effects

Alternative 1

Since the Record of Decision for the Travel Management Project was signed in September 2011, the Travel Management Decision started to be implemented starting in January 2012. The decision does the following:

- Limits motor vehicle use to designated roads, trails, and areas shown on the Motor Vehicle Use Maps
- Designates some gravel pits open to motorized access
- Creates new conditions for motor vehicle access off of designated roads for dispersed camping
- Changes some system roads to highway legal vehicle use only

No existing open designated roads or motorized trails were closed as a result of the decision; however, changes to cross-country travel, motorized access for dispersed camping, and motorized mixed use (highway legal and non-highway legal vehicles) of some system roads were made. Cross-country travel is no longer allowed on the Ochoco National Forest. Motorized access for dispersed camping is only allowed to existing sites within 300 feet of roads shown on the Motor Vehicle Use Map and motor vehicles cannot drive closer than 30 feet to any wetland, stream, or water body at dispersed campsites. The decision makes no changes to developed campgrounds and does not apply to over-snow motorized travel or permitted activities such as firewood cutting.

Under Alternative 1, the No Action Alternative, no trails would be added for use specifically by any type vehicle; travel would only be allowed as designated by the Motor Vehicle Use Map (MVUM). In general, this alternative represents the continuation of the existing condition; however, since the Travel Management Decision was not implemented until starting in January 2012, the effects of this decision have not been realized in the Ochoco Summit project area. It would be expected that with the cessation of cross-country motorized travel across the Ochoco National Forest that watershed health indicators would improve somewhat, though the user-created trails would remain on the landscape for a period of time until they naturally revegetated or future projects are proposed and implemented to decommission user-created, non-system roads.

Effects Common to All Watersheds

Flow and Sediment Regimes

Implementation of Alternative 1 would allow for existing user-created roads to heal, reducing the connectivity slightly between streams and roads (including user-created). System roads designated as Level 2, 3, 4 or 5, however, would remain open to use by the public and therefore the system road density and stream crossing density would remain the same as the existing condition and peak flows would not have the potential to increase as a result. The flow and sediment regime existing conditions would continue to exist in the Ochoco Summit project area watersheds with slight improvements over time as the effects of implementation of the Travel Management project are realized.

Sediment/Turbidity

Implementation of this alternative would provide for the greatest improvements to streambank alteration and vegetative conditions within the shortest time frame. There would be no vehicles crossing streams, directly impacting streambanks at crossing locations. There would be no further effects to width-to-depth ratio, entrenchment, or sediment yield than what currently exists. In addition, by reducing the density of user created roads and stream crossings, peak flows would not be affected or would slightly decrease as a result, in turn maintaining or slightly decreasing bank erosion downstream of stream crossings. Cessation of cross-country travel across the Ochoco National Forest would facilitate a more rapid increase than is presently occurring in bank stability and prevent vehicle-related loss of bank stabilizing riparian vegetation.

In addition to improved bank stability, Alternative 1 would maintain or slightly reduce the density of roads, in the form of user-created roads, within the vicinity of streams and wetlands. By reducing the overall road densities, less sediment would be delivered to streams and wetlands, resulting in improved water quality.

Rates of recovery would be expected to vary across this project area. Most streambanks would be expected to stabilize with vegetation over the next 10-15 years, if some extent of riparian vegetation is already present. Previously altered sites presently lacking a riparian vegetation component would take longer to recover vegetation and stabilize streambanks. Recovery of riparian vegetation may take 15+ years in these sites; due to soil type and other factores, some sites may not be capable of producing riparian vegetation without some sort of active management. Streambanks with vertical

streambanks (cutbanks) would take several decades or more to adjust bank slopes and stabilize with vegetation, even without cross-country travel.

The channel sensitivity and recovery potential of streams in the Ochoco Summit project area vary from stream to stream by channel type (Rosgen 2009). Most of the surveyed stream channels within the project area are gravel-dominated and consist mostly of moderately steep, moderately sinuous, moderately entrenched stream channels (B type-channels) and slightly entrenched, moderately to high sinuosity, and less step stream channels (C type-channels). Gravel-dominated B channel types have a moderate sensitivity to disturbance and an excellent recovery potential while gravel-dominated C channel types have a very high sensitivity to disturbance and a good recovery potential (Rosgen 2009). Short portions of streams in the project area are characterized as G-type channels, one such reached was identified by a stream survey in Peterson Creek. The B and C channel type streams would recover more rapidly than the G-type segments of stream. Areas that are currently entrenched (G and F-type channels) would remain as such until vertical side slopes naturally adjust and become vegetated. The return to original conditions (pre-European) on some sites would be very slow or non-existent (Laycock 1989; Winward 1991). Sediment yield from these entrenched systems would continue to exist, but would decline as streambanks adjust slope and become vegetated.

Overall, this alternative would have the least impacts to streambanks across all Ochoco Summit project area subwatersheds. Cessation of cross-country travel across the Ochoco National Forest would facilitate a more rapid increase than is presently occurring in bank stability and prevent loss of bank stabilizing riparian vegetation. Areas that are currently entrenched (G and F-type channels) would continue to adjust and may take several decades to become stable with vegetation. Sediment yield from these entrenched systems would continue to exist, but would decline as streambanks adjust slope and become vegetated.

Alternative 2

Alternative 2, the Proposed Action, focuses on designating motorized trails and supporting areas, in conjunction with opportunities that would remain on mixed use roads identified on the MVUM. Alternative 2 proposes a total of 69 miles of Class I vehicle (ATV) trails or roads, 48 miles of Class II vehicle (jeep, small truck and buggy) trail/roads, and 52 miles of Class III vehicle (motorcycle) trail/roads. These projects would result in more effects to the streams and watersheds within the Ochoco Summit project area as compared to Alternative 1, the no action alternative. During trail construction and prior to vegetation re-establishment (approximately 2-3 years), with the implementation of Alternative 2, sediment delivery would increase; however, once user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition based on implementation of design criteria and water quality best management practices (see Water Quality and Aquatic Organisms and Soils section under Resource Protection Measures in Chapter 2 of this document).

Effects Common to All Watersheds

Flow and Sediment Regimes

Overall, this alternative would have a beneficial impact on flow and sediment regimes in the Ochoco Summit project area subwatersheds relative to the historic allowance of OHV cross-country travel. In the long-term (15+ years), once vegetation has reestablished, connectivity of roads and trails with streams would be reduced, resulting in decreased peak flow magnitudes. However, relative to the no action alternative, proposed trails in Alternative 2 would increase the overall road/trail density and stream crossing density. Increased road/trail densities have the potential to increase drainage density, resulting in increased connectivity and peak flow magnitudes.

Sediment/Turbidity

Overall, this alternative would reduce impacts relative to water quality, in particular sediment and turbidity. Relative to OHV cross-country travel, sediment and turbidity related water quality would be maintained or slightly improved through an overall reduction in the number of stream and wetland crossing locations, improved stream crossing types, improved trail drainage, reduction in the miles of trail in the vicinity of perennial and intermittent streams, and anticipated decreased peak flow magnitudes.

As compared to historic OHV cross-country travel impacts, streambank conditions are expected to maintain or slightly improve over time with the implementation of Alternative 2. Relative to OHV cross-country travel, fewer stream crossings would occur within all subwatersheds and culverts or bridges would be installed at all new perennial and intermittent stream crossings. By reducing the number of crossings locations relative to cross-country travel and by not allowing fords, direct streambank impacts would be reduced. Alternative 2 would have more impact on streambanks as compared to the no action alternative with increased stream crossings and potential disturbance during culvert or bridge installation. Areas that are currently entrenched (G and F-type channels) would continue to adjust and may take several decades to become stable with vegetation. Sediment yield from these entrenched systems would continue to exist, but would decline as streambanks adjust slope and become vegetated.

As the effects of the implementation of the Travel Management Decision that omits cross-country travel across the Ochoco National Forest are realized, impacts to Groundwater-Dependant Ecosystems (GDEs) in the form of wetlands, wet meadows, and springs would be reduced even with the designation of the trail network in Alternative 2. User created trails across GDEs would naturally revegetate over time and trails that cross GDEs would have minimal effect through the implementation of the design criteria. Design criteria state that trails would either be rerouted to “avoid meadows, seeps, and springs” or “puncheon stringers” would need to be installed that would elevate the trail above the GDE. Overall, however, Alternative 2 would have slightly more effect on GDEs through increased road/trail densities in and within GDE RHCAs through increased disturbance levels compared to the no action alternative.

In the long-term, Alternative 2 would result in reduced sediment delivery to streams overall through improved trail drainage, periodic trail maintenance, reduced trail densities near streams, and reduced peak flows as compared to historic OHV cross-country uses in the Ochoco Summit project area. During trail construction and prior to vegetation re-establishment (approximately 2-3 years), with the implementation of Alternative 2, sediment delivery would increase; however, once user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition based on implementation of design criteria and water quality best management practices (see Water Quality and Aquatic Organisms and Soils section under Resource Protection Measures in Chapter 2 of this document). User-created trails that have been created over time do not have proper drainage, are not maintained, and cross over a larger portion of the landscape including across streams. Alternative 2 includes design criteria that require outsloping and hardening approaches to stream crossings and installing rolling dips to disperse water from the trail, reduces the number of locations where OHVs can cross intermittent and perennial streams, and reduces the density of trails within the sediment delivery zone (300 feet), which should reduce erosion and sediment delivery to streams. Reduced peak flows also dissipate the effects of sediment delivery to streams by reducing the potential for rilling to occur along the trails or where flow is diverted off the trail onto the hillslope above the stream channel.

Overall, this alternative would be consistent with the water goals and maintaining cutbank levels to below 20 percent as outlined in the LRMP. This alternative would be consistent with the Riparian Management Goal of maintaining bank stability greater than 80 percent outlined in INFISH and with

the RMO. This alternative would protect designated beneficial uses and would be consistent with the Clean Water Act and Executive Orders 11988, 11990, and 12088. Proposed trail in some site-specific locations in the Deep Creek Watershed, however, would not be consistent with the purpose and need of the Deep Creek Restoration EA, specifically the goal of reducing stream sedimentation as a result of site specific sediment delivery and bank stability concerns (see section titled "Cumulative Effects" in Chapter 3 of this document for more information). In addition, due to channel instability resulting from the Maxwell Fire, reopening a road that has been effectively decommissioned that crosses Allen Creek, has the potential to affect channel recovery and increase turbidity in Allen Creek. See Table 83 for specific locations with hydrologic concerns.

Lower Beaver Creek Watershed

Alternative 2 proposes 9.1 miles of Class III trail within the Lower Beaver Creek Watershed. Approximately, 4.1 miles of the total are proposed on existing National Forest System Roads and approximately 5.0 miles would be new trail construction. Approximately 0.2 miles of new trail and 1.0 miles of trail on existing roads in the Lower Beaver Creek Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. A total of three existing stream crossings are proposed for use, all of which would cross intermittent streams.

North Wolf Creek Subwatershed

Within the North Wolf Creek Subwatershed, approximately 3.2 miles of existing National Forest System Road, mostly closed roads, and approximately 1.2 miles of new trail are proposed to be constructed as part of Alternative 2. The 1.2 miles of new trail would be located predominately along ridges and in areas not adjacent to stream channels.

Flow and Sediment Regimes

Designating Class III trails in the Alternative 2 proposed locations in the North Wolf Creek Subwatershed would have the effect of improving flow and sediment regime conditions in the long-term relative to past cross-country travel and would essentially maintain flow and sediment conditions relative to the no action alternative. By adding approximately 1.2 miles of trail to the overall subwatershed road/trail network, Alternative 2 would increase the road/trail densities from 3.0 to 3.3 miles per square mile; however, relative to the overall range in existing road densities across the Ochoco Summit project area, the rating for road/trail densities would remain moderate. Drainage densities are relatively high (2.9 miles per square mile); however, by not adding any new intermittent or perennial stream crossings in the North Wolf Creek Subwatershed, Alternative 2 would not change the overall stream crossing density (3.3 crossings per square mile with a moderate rating). In addition, all of the trails proposed within this subwatershed as part of Alternative 2 are Class III trails, designed for 24-inch wide motorcycle clearance, which would have much less disturbance and potential for capture of drainage compared to the wider Class I and Class II trails. Since the majority of the trails proposed in the North Wolf Subwatershed would be located on existing roads and the new trails would not cross intermittent or perennial stream channels, this minor increase in road/trail densities across the subwatershed would not be likely to increase the flow and sediment regime relative to the existing condition.

Sediment/Turbidity

Designating Class III trails in the Alternative 2 proposed locations in the North Wolf Creek Subwatershed would have the effect of improving water quality conditions in the long-term relative to past cross-country travel and would essentially maintain water quality conditions relative to the no action alternative. Approximately 0.2 miles of trail would be added within 300 feet of an intermittent stream, no new stream crossings would be added, and no new trail is proposed that crosses known GDEs within the forest boundary portion of the subwatershed.

By adding approximately 0.2 miles of trail to the road/trail network within the sediment delivery zone of streams in the North Wolf Creek Subwatersheds, Alternative 2 would increase the road/trail densities from 6.3 to 6.4 miles per square mile; however, relative to the overall range in existing road densities across the Ochoco Summit project area, the rating for road/trail densities within 300 feet of streams would remain moderate. Slope Erosion Hazard Ratings are relatively high; however, because Alternative 2 would not add any new intermittent or perennial stream crossings and would add minimal trail length (0.2 miles) near streams in the North Wolf Creek Subwatershed, the additional erosion potential would not be expected to measurably increase sediment delivery to the streams or stream turbidity in the North Wolf Creek Subwatershed.

Upper North Fork Crooked River Watershed

Alternative 2 proposes approximately 25 miles of Class I trail, approximately 45 miles of Class II trail, and approximately 8.6 miles of Class III trail within the Upper North Fork Crooked River Watershed. Approximately 12 miles of Class I trail, 33 miles of Class II trail, and 4.2 miles of Class III trail are proposed on existing National Forest System Roads. Approximately 13 miles of Class I trail, 12 miles of Class II trail, and 4.4 miles of Class III trail would be trails not already part of the existing National Forest System road network. Approximately 6.8 miles of new trail and 16.8 miles of trail proposed on existing roads in the Upper North Fork Crooked River Watershed would be located within the sediment delivery zone (300 feet) of perennial or intermittent streams. A total of 24 new and 40 existing intermittent and perennial stream crossings are proposed for use.

Elliot Creek Subwatershed

Within the Elliot Creek Subwatershed, approximately 7.7 miles of Class I trail and 2.5 Class III trail are proposed on existing National Forest System Road and approximately 2.5 miles of Class I trail and 2.2 miles of Class III new trail are proposed to be constructed as part of Alternative 2. Alternative 2 proposes for Class I trails to cross perennial and intermittent streams at 12 locations at existing stream crossings on existing roads and to cross perennial and intermittent streams with new trails at five locations. In addition, Class III trails are proposed to cross perennial and intermittent streams at one location at an existing stream crossing on an existing road and to cross perennial and intermittent streams with new trails at four locations.

The Maxwell Fire BAER rehabilitation road treatments included rehabilitation work on segments of two roads within the Elliot Creek Subwatershed, FS 2200-505 and FS 2200-500. Approximately 0.04 miles of Class I trail would overlap FS 2200-500 where water bars were recommended to enable roads to better handle expected surface runoff increases. Approximately 0.24 miles of Class I trail would overlap FS 2200-505, which crosses one intermittent and one perennial tributary to Elliot Creek and parallels the stream within the RHCA for almost the entire segment length. The crossing over the perennial tributary to Elliot Creek that existed before the Maxwell Fire was undersized and was removed and replaced with rock ford as part of the Maxwell Fire BAER rehabilitation. Based on design criteria, implementation of the Alternative 2 trail system would require installation of a culvert or bridge at this stream crossing location. Based on the BAER report for the Maxwell Fire, the vegetative recovery period was seven years, which would indicate hydrologic recovery should occur by the end of the summer of 2013.

Flow and Sediment Regimes

Constructing new Class I and III trails and stream crossings at the locations proposed in Alternative 2 in the Elliot Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term (i.e. approximately 2-3 years post-construction) relative to past cross-country travel; however, compared to the no action alternative, it could increase the effects of flow and sediment regime on the subwatershed by increasing road/trail densities and stream crossing densities overall. By adding approximately 4.7 miles of trail to the overall subwatershed road/trail network, Alternative

2 would increase the road/trail densities from 3.3 to 3.6 miles per square mile, increasing trail/road density conditions from low to moderate relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively high (2.8 miles per square mile) and by adding nine new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Elliot Creek Subwatershed, Alternative 2 would increase the overall stream crossing density from 3.4 to 4.0 crossings per square mile, bringing the overall rating up from moderate to high relative to the other Ochoco Summit project area subwatersheds. Overall, slope erosion hazard conditions are high in the vicinity of streams in the Elliot Creek Subwatershed, which can make interconnectivity of roads and streams more likely, potentially resulting in increased peak flows in streams. Increases in the road/trail and stream crossing densities across the Elliot Creek Subwatershed, in combination with poor slope erosion hazard conditions, potentially increases the flow and sediment regime relative to the existing condition.

Sediment/Turbidity

Designating Class I and III trails and constructing new trails and stream crossings at the locations proposed in Alternative 2 in the Elliot Creek Subwatershed may improve somewhat the bank stability and sediment delivery conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the sediment delivery to streams and exacerbate bank stability conditions at some site-specific locations in the subwatershed (see Table 83). During trail construction and prior to vegetation re-establishment (approximately 2-3 years), with the implementation of Alternative 2, sediment delivery would increase; however, once user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition based on implementation of design criteria and water quality best management practices (see Water Quality and Aquatic Organisms and Soils section under Resource Protection Measures in Chapter 2 of this document).

Approximately 2.0 miles of trail would be added within 300 feet of an intermittent stream, nine new stream crossings would be added, and 0.2 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 2.0 miles of trail to the road/trail network within the sediment delivery zone of streams in the Elliot Creek Subwatershed, Alternative 2 would increase the road/trail densities from 4.3 to 4.6 miles per square mile; however, relative to the overall range in existing road densities across the Ochoco Summit project area, the rating for road/trail densities within 300 feet of streams would remain low. The addition of 0.2 miles of trail within GDEs and associated RHCAs would raise road densities in GDEs from approximately 2.8 to 3.0 miles per square mile, maintaining a low rating relative to other project subwatersheds. Slope Erosion Hazard Ratings are relatively high, making erosion and potentially sediment delivery more likely in the subwatershed.

Existing bank stability in Fox Creek, the only stream in the Elliot Creek Subwatershed with a Level II stream survey conducted, is relatively good and met LRMP standards as of 2002. In addition, the dominant channel type of Fox Creek has moderate channel sensitivity and recovery potential. Other reaches of Fox Creek are classified as A4 and C4 channel types. A4 channel types generally have extreme channel sensitivity and very poor recovery potential, while C4 channel types generally have very high channel sensitivity and good recovery potential. No new trails are proposed to cross or parallel Fox Creek. Assuming that other streams in the Elliot Creek Subwatershed exhibit similar dominant channel type conditions and the implementation of design criteria that require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, bank stability is likely to be maintained, unless increased peak flows result from increases in road/trails and stream networks.

Based on high Slope Erosion Hazard conditions, increases in both road/trail densities within the sediment delivery zone, and increases in stream crossing densities, new trails proposed under

Alternative 2 have the potential to increase sediment delivery to streams; however, bank stability is likely to be maintained.

Howard Creek Subwatershed

Within the Howard Creek Subwatershed, approximately 1.5 miles of Class I trail and 1.8 Class III trail would be located on existing National Forest System Road and approximately 5.5 miles of Class I trail and 2.1 miles of Class III new trail are proposed to be constructed as part of Alternative 2. Alternative 2 proposes for Class I trails to cross perennial and intermittent streams with new trails at four locations. In addition, Class III trails are proposed to cross perennial and intermittent streams at one location at an existing stream crossing on an existing road.

Flow and Sediment Regimes

Designating Class I and III trails and constructing new trails and stream crossings at the locations proposed in Alternative 2 in the Howard Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the effects of flow and sediment regime on the subwatershed by increasing road/trail densities and stream crossing densities overall. By adding approximately 7.6 miles of trail to the overall subwatershed road/trail network, Alternative 2 would increase road/trail densities from 4.6 to 5.1 miles per square mile, both of which are high relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively moderate (2.2 miles per square mile) and by adding four new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Howard Creek Subwatershed, Alternative 2 would increase overall stream crossing density from 4.1 to 4.4 crossings per square mile, both of these densities are high relative to the other Ochoco Summit project area subwatersheds. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Howard Creek Subwatershed. Increases to the already high road/trail and stream crossing densities across the Howard Creek Subwatershed have the potential to increase peak flows and shorten response times relative to the existing condition.

Sediment/Turbidity

Designating Class I and III trails and constructing new trails and stream crossings at the locations proposed in Alternative 2 in the Howard Creek Subwatershed may improve somewhat the bank stability and sediment delivery conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the sediment delivery to streams. During trail construction and prior to vegetation re-establishment (approximately 2-3 years), with the implementation of Alternative 2, sediment delivery would increase; however, once user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition based on implementation of design criteria and water quality best management practices (see Water Quality and Aquatic Organisms and Soils section under Resource Protection Measures in Chapter 2 of this document).

Approximately 1.4 miles of trail would be added within 300 feet of an intermittent stream, four new stream crossings would be added, and 1.1 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 1.4 miles of trail to the road/trail network within the sediment delivery zone of streams in the Howard Creek Subwatershed, Alternative 2 would increase the road/trail densities from 8.2 to 8.6 miles per square mile; both of these densities are high relative to the other Ochoco Summit project area subwatersheds. The addition of 1.1 miles of trail within GDEs and associated RHCAs would raise road densities in GDEs from approximately 6.9 to 7.4 miles per square mile, bringing the overall rating up from moderate to high relative to the other subwatersheds.

Existing bank stability in surveyed streams in the Howard Creek Subwatershed is relatively good and met LRMP standards between 1994 and 2001. In addition, the dominant channel types of streams in the subwatershed are B4 channel types, which have moderate channel sensitivity and excellent recovery potential. At the proposed location of the new Class I trail stream crossing on Howard Creek, the channel type indicates that the channel should have low streambank erosion potential. No channel type information was gathered for the remaining three new stream crossings in the Howard Creek Subwatershed. Dominant channel types in Howard Creek, South Fork Howard Creek, and West Fork Howard Creek indicate moderate channel sensitivity and excellent recovery potential, whereas dominant channel type in East Fork Howard Creek indicates very high channel sensitivity and good recovery potential of the stream. Assuming that other streams in the Howard Creek Subwatershed exhibit similar dominant conditions to Howard Creek and the implementation of design criteria that require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, bank stability is likely to be maintained, unless increased peak flows result from increases in road/trails and stream networks.

Based on increases in both road/trail densities within the sediment delivery zone and within and near GDEs, new trails proposed under Alternative 2 would have the potential to increase sediment delivery to streams; however, bank stability is likely to be maintained.

Peterson Creek Subwatershed

Within the Peterson Creek Subwatershed, approximately 2.4 miles of Class I trail and 15.2 Class II trail are proposed to be located on existing National Forest System Road and approximately 2.9 miles of Class I trail and 4.4 miles of Class II new trail are proposed to be constructed as part of Alternative 2. Alternative 2 proposes for Class I trails to cross perennial and intermittent streams with new trails at three locations and to cross perennial and intermittent streams on existing roads at two locations. Class II trails are proposed to cross perennial and intermittent streams at one new location and to cross perennial and intermittent streams at eight locations at existing stream crossings on existing roads. In addition, a two mile switchback section of new Class II trail would be located approximately 100 feet upslope to the east of Peterson Creek, a fish-bearing perennial stream, on a slope with a High Slope Erosion Hazard; the switchback would cross five ephemeral streams.

The Maxwell Fire BAER rehabilitation road treatments included rehabilitation work on segments of one road within the Peterson Creek Subwatershed, FS 2200-550. Approximately 0.18 miles of Class I trail overlap FS 2200-550, which crosses Allen Creek, a fish-bearing perennial stream. The crossing structure was removed and banks were laid back as part of the Maxwell Fire BAER rehabilitation. Based on design criteria, implementation of the Alternative 2 trail system would require installation of a culvert or bridge at this stream crossing location. The operational maintenance level of this road is Level I (Closed); however, the objective maintenance of this road is decommissioned, likely attributed to the potential for sedimentation into a high quality, fish-bearing perennial stream. Based on the BAER report for the Maxwell Fire, the vegetative recovery period was seven years, which would indicate hydrologic recovery should occur by the end of the summer of 2013. Field trips to the site during the summer of 2011 indicated that Allen Creek, in the vicinity of this stream crossing, was still in an unstable state and was still in the process of recovering from impacts from the Maxwell Fire.

Flow and Sediment Regimes

Designating Class I and II trails and constructing new trails and stream crossings at the locations proposed in Alternative 2 in the Peterson Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the effects of flow and sediment regime on the subwatershed by increasing road/trail densities and reopening roads slated for decommissioning. By adding approximately 7.3 miles of trail to the overall subwatershed road/trail network, Alternative 2

would increase the road/trail densities from 3.2 to 3.6 miles per square mile, increasing the rating from low to moderate relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively high (2.7 miles per square mile) and by adding four new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Peterson Creek Subwatershed, Alternative 2 would increase the overall stream crossing density from 2.7 to 2.9 crossings per square mile, both of these densities are moderate relative to the other Ochoco Summit project area subwatersheds. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Peterson Creek Subwatershed. Increases to the already high road/trail across the Peterson Creek Subwatershed have the potential to slightly increase peak flows and shorten response times relative to the no action alternative.

By constructing two miles of new trail East of Peterson Creek on a slope with High Slope Erosion Hazard, Alternative 2 has the potential to create connectivity between the intermittent streams and the trail surface. Since the drainage area of the streams is small, they are not likely to significantly increase peakflows; however, erosion and sediment delivery to Peterson Creek has a much higher potential.

Sediment/Turbidity

Designating Class I and II trails and constructing new trails and stream crossings at the locations proposed in Alternative 2 in the Peterson Creek Subwatershed may improve somewhat the bank stability conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the sediment delivery to streams at site specific locations.

Approximately 1.3 miles of trail would be added within 300 feet of an intermittent or perennial stream, four new stream crossings would be added, and virtually no miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 1.3 miles of trail to the road/trail network within the sediment delivery zone of streams in the Peterson Creek Subwatershed, Alternative 2 would increase road/trail densities from 4.3 to 4.5 miles per square mile; both of these densities are low relative to the other Ochoco Summit project area subwatersheds. The addition of virtually no new miles of trail within GDEs and associated RHCAs would maintain road densities in GDEs at approximately 5.5 miles per square mile, which is low relative to the other subwatersheds.

Existing bank stability in surveyed streams in the Peterson Creek Subwatershed is relatively good and met LRMP standards in 2001 in the East Fork of Allen Creek; however, bank stability is predominately relatively fair and not meeting LRMP standards in Allen Creek and Peterson Creek, based on stream surveys in 2002 and 2006-2007, respectively. The 2007 Level II stream survey in Peterson Creek found unstable bank conditions with cutbanks of approximately 36 percent of the length of Reach 6 where a Class II trail overlaps the FS 2630 road and crosses the stream. In addition, the dominant channel types of streams in the subwatershed are C4 channel types, which have very high channel sensitivity and good recovery potential. At the location of the new Class I trail stream crossing on the East Fork of Allen Creek as well as through the stream reaches that were surveyed, the channel type indicates that the channel should have very high streambank erosion potential. Since peakflow increases are expected to be minor and design criteria require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, overall bank stability is likely to be maintained. At site specific locations; however, by converting a closed road, with an objective maintenance of decommissioned, to Class I trail that crosses Allen Creek in an unstable portion of the stream and by adding two miles of Class II trail on a High Slope Erosion Hazard slope near Peterson Creek, site specific locations may experience higher incidents of unstable banks and sediment delivery.

Based on site specific sediment delivery and bank stability concerns, Alternative 2 proposed trails have the potential to increase sediment delivery to streams and unstable banks at site specific

locations, which would delay recovery to LRMP standards of bank stability in Allen Creek and potentially add to sediment and turbidity increases in Peterson Creek.

Porter Creek Subwatershed

Within the Porter Creek Subwatershed, approximately 0.26 miles of Class I trail and 17.7 miles of Class II trail located on existing National Forest System Road. Approximately 2.1 miles of Class I trail, 7.3 miles of Class II trail, and 0.04 miles of Class III new trail are proposed to be constructed as part of Alternative 2. No Class I trails are proposed to cross intermittent or perennial stream channels in Alternative 2. Class II trails are proposed to cross perennial and intermittent streams at 16 locations at an existing stream crossing on an existing road and at 7 new locations. No new trails are proposed that intersect GDEs or associated RHCAs.

Flow and Sediment Regimes

Designating Class I and II trails and constructing new trails and stream crossings at the locations proposed in Alternative 2 in the Porter Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the effects of flow and sediment regime on the subwatershed by increasing road/trail densities and stream crossing densities overall. By adding approximately 9.4 miles of trail to the overall subwatershed road/trail network, the road/trail densities increase from 3.7 to 4.4 miles per square mile, raising the rating from moderate to high relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively high (2.8 miles per square mile) and by adding seven new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Porter Creek Subwatershed, the overall stream crossing density increases from 4.0 to 4.4 crossings per square mile, both of these densities are high relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are low in the vicinity of streams in the Porter Creek Subwatershed. Increases to the road/trail and already high stream crossing densities across the Porter Creek Subwatershed have the potential to increase peak flows and shorten response times relative to the existing condition.

Sediment/Turbidity

Designating Class I and II trails and constructing new trails and stream crossings at the locations proposed in Alternative 2 in the Porter Creek Subwatershed may improve somewhat the bank stability and sediment delivery conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the sediment delivery to streams. In the short-term with the implementation of Alternative 2 in this subwatershed, sediment delivery would increase; however, in the long-term, once most user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition.

Approximately 2.1 miles of trail would be added within 300 feet of an intermittent stream, seven new stream crossings would be added, and essentially no miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 2.1 miles of trail to the road/trail network within the sediment delivery zone of streams in the Porter Creek Subwatershed, the road/trail densities increase from 7.4 to 7.8 miles per square mile, both of these densities are high relative to the other Ochoco Summit project area Subwatersheds analyzed. Slope Erosion Hazard conditions for the Porter Creek Subwatershed are low overall, somewhat reducing the risk and magnitude of potential sediment delivery increases for the proposed trail network in Alternative 2.

Existing bank stability in surveyed streams in the Porter Creek Subwatershed was relatively good and met LRMP standards in Easter Porter Creek in 1995 and in the top and bottom reaches of Porter Creek in 2006-2007. Bank stability in the middle reach of Porter Creek in 2007 slightly exceeded

LRMP standards with approximately 23 percent of the stream length unstable. No trails are proposed to cross Porter Creek on the reach of stream that is not meeting LRMP standards of no more than 20 percent unstable banks. Dominant channel types in Porter Creek indicate moderate channel sensitivity and excellent recovery potential. Assuming that other streams in the Porter Creek Subwatershed exhibit similar dominant conditions to Porter Creek and implementation of design criteria that require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, bank stability is likely to be maintained, unless increased peak flows result from increases in road/trails and stream networks.

Based on increases in both stream crossing and road/trail densities within the sediment delivery zone, Alternative 2 proposed new trails have the potential to increase sediment delivery to streams as described in the Aquatic Species section; however, banks stability is likely to be maintained.

Deep Creek Watershed

Alternative 2 proposes approximately 31 miles of Class I trail, approximately 2.7 miles of Class II trail, and approximately 32 miles of Class III trail within the Deep Creek Watershed. Approximately 20 miles of Class I trail, 2.4 miles of Class II trail, and 18 miles of Class III trail are proposed on existing National Forest System Roads. Approximately 11 miles of Class I trail, 0.32 miles of Class II trail, and 14 miles of Class III trail would be new trails and not already part of the existing National Forest System road network. Approximately 3.7 miles of new trail and 12.7 miles of trail on existing roads in the Deep Creek Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. A total of 14 new and 22 existing intermittent and perennial stream crossings are proposed for use.

Jackson Creek Subwatershed

Within the Jackson Creek Subwatershed, approximately 9.3 miles of Class I trail, 2.4 miles of Class II trail, and 14.3 miles of Class III trail are located on existing National Forest System Road. Approximately 5.4 miles of Class I trail, 0.32 miles of Class II trail, and 5.6 miles of Class III new trail are proposed to be constructed as part of Alternative 2. Alternative 2 proposes for Class I trails to cross perennial and intermittent streams with new trails at seven locations and to cross perennial and intermittent streams on existing roads at three locations. Class II trails are proposed to cross perennial and intermittent streams at no new locations and to cross perennial and intermittent streams at one location at an existing stream crossing on an existing Level II, high clearance road. Class III trails are proposed to cross perennial and intermittent streams at two new locations and to cross perennial and intermittent streams at ten locations at existing stream crossings on existing roads.

Flow and Sediment Regimes

Designating Class I, II, and III trails and constructing new trails and stream crossings at the locations proposed in Alternative 2 in the Jackson Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the effects of flow and sediment regime on the subwatershed by increasing overall road/trail and stream crossing densities. By adding approximately 11 miles of new trail to the overall subwatershed road/trail network, the road/trail densities increase from 3.7 to 4.0 miles per square mile, both ratings are moderate relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively low (1.8 miles per square mile) and by adding nine new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Jackson Creek Subwatershed, the overall stream crossing density increases from 1.8 to 2.1 crossings per square mile, both of these densities are low relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Jackson Creek Subwatershed. Based on relatively low drainage and stream crossing densities, increases to the road/trail density and stream

crossings density across the Jackson Creek Subwatershed are likely to have little effect on peak flows, with the potential for an immeasurable increase relative to the no action alternative.

Sediment/Turbidity

Designating Class I, II, and III trails and constructing new trails and stream crossings at the locations proposed in Alternative 2 in the Jackson Creek Subwatershed may improve somewhat the bank stability conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the sediment delivery to streams. During trail construction and prior to vegetation re-establishment (approximately 2-3 years), with the implementation of Alternative 2, sediment delivery would increase; however, once user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition based on implementation of design criteria and water quality best management practices (see Water Quality and Aquatic Organisms and Soils section under Resource Protection Measures in Chapter 2 of this document).

Approximately 1.6 miles of trail would be added within 300 feet of an intermittent or perennial stream, nine new stream crossings would be added, and 0.7 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 1.6 miles of trail to the road/trail network within the sediment delivery zone of streams in the Jackson Creek Subwatershed, the road/trail densities increase from 6.1 to 6.3 miles per square mile, both of these densities are moderate relative to the other Ochoco Summit project area Subwatersheds analyzed. The addition of 0.7 miles of trail within GDEs and associated RHCAs increases the road densities in GDEs from 5.6 to 5.8 miles per square mile, which are low relative to the other subwatersheds. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Jackson Creek Subwatershed.

Existing bank stability in surveyed streams in the Jackson Creek Subwatershed is relatively good and met LRMP standards in Happy Camp Creek and Jackson Creek from 1998 and 2010. Based on Level II stream surveys, the dominant channel types of streams in Happy Camp Creek are E4 channel types and in Jackson Creek are C4 channel types, which have very high channel sensitivity and good recovery potential. At the location of the two new Class I trail stream crossings on Happy Camp Creek, the channel types indicate that the channel should have moderate and high streambank erosion potential. At the new Class I stream crossing location on Jackson Creek, the channel type indicates a moderate streambank erosion potential. Since peakflow increases are expected to be minor and design criteria require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, overall bank stability is likely to be maintained.

Based on slight increases in both road/trail densities within the sediment delivery zone and in GDEs, as well as overall moderate Slope Erosion Hazard Conditions, Alternative 2 proposed new trails have the potential to slightly increase sediment delivery to streams and GDEs; however, banks stability is likely to be maintained.

Little Summit Prairie Creek Subwatershed

Within the Little Summit Prairie Creek Subwatershed, approximately 4.1 miles of Class I trail and 3.6 miles of Class III trail are located on existing National Forest System Road. Approximately 1.2 miles of Class I trail and 5.8 miles of Class III new trail are proposed to be constructed as part of Alternative 2. Alternative 2 proposes for Class I trails to cross perennial and intermittent streams with new trail at one location and to cross a perennial or intermittent stream on an existing road at one location. Class III trails are proposed to cross perennial and intermittent streams at no new locations and to cross perennial and intermittent streams at two locations at existing stream crossings on existing roads.

Flow and Sediment Regimes

Designating Class I and Class III trails and constructing new trails and stream crossings at the locations proposed in Alternative 2 in the Little Summit Prairie Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the effects of flow and sediment regime on the subwatershed by increasing overall road/trail and stream crossing densities. By adding approximately seven miles of new trail to the overall subwatershed road/trail network, the road/trail densities increase from 3.8 to 4.1 miles per square mile, bringing the rating from moderate to high relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively low (2.2 miles per square mile) and by adding one new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Little Summit Prairie Creek Subwatershed, the overall stream crossing density increases from 2.5 to 2.6 crossings per square mile, both of these densities are moderate relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Little Summit Prairie Creek Subwatershed. Based on relatively low drainage densities, increases to the road/trail density and stream crossings density across the Little Summit Prairie Creek Subwatershed are likely to have little effect on peak flows, with the potential for an immeasurable increase relative to the no action alternative.

Sediment/Turbidity

Designating Class I and III trails and constructing new trails and stream crossings at the locations proposed in Alternative 2 in the Little Summit Prairie Creek Subwatershed may improve somewhat the bank stability conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the sediment delivery to streams. In the short-term with the implementation of Alternative 2 in this subwatershed, sediment delivery would increase; however, in the long-term, once most user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition.

Approximately 0.6 miles of trail would be added within 300 feet of an intermittent or perennial stream, one new stream crossings would be added, and 0.4 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 0.6 miles of trail to the road/trail network within the sediment delivery zone of streams in the Little Summit Prairie Creek Subwatershed, the road/trail densities increase from 7.4 to 7.5 miles per square mile, both of these densities are high relative to the other Ochoco Summit project area Subwatersheds analyzed. The addition of 0.4 miles of trail within GDEs and associated RHCAs increases the road densities in GDEs from 5.1 to 5.4 miles per square mile, which are low relative to the other subwatersheds. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Little Summit Prairie Creek Subwatershed.

Existing bank stability in surveyed streams in the Little Summit Prairie Creek Subwatershed is relatively good and met LRMP standards in surveyed reaches of Little Summit Creek and an unnamed tributary in 1998 and 2010. Based on Level II stream surveys, the dominant channel types of streams in the Little Summit Prairie Creek Subwatershed are C4 channel types, which have very high channel sensitivity and good recovery potential. At the location of the new Class I trail stream crossings on Little Summit Creek, the channel type is a B3 channel type, which indicates that the channel should have low streambank erosion potential. Since peakflow increases are expected to be minor, streambank erosion based on channel type at the stream crossing is low, and design criteria require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, overall bank stability is likely to be maintained.

Based on slight increases in both road/trail densities within the sediment delivery zone and in GDEs, as well as overall moderate Slope Erosion Hazard Conditions, Alternative 2 proposed new trails have

the potential to slightly increase sediment delivery to streams and GDEs; however, banks stability is likely to be maintained.

Lower Deep Creek Subwatershed

Within the Lower Deep Creek Subwatershed, approximately 7.0 miles of Class I trail are located on existing National Forest System Road and approximately 4.1 miles of Class I trail and 2.9 miles of Class III new trail are proposed to be constructed as part of Alternative 2. Alternative 2 proposes for Class I trails to cross perennial and intermittent streams with new trails at three locations and to cross perennial and intermittent streams on existing roads at five locations. Class III trails are proposed to cross perennial and intermittent streams at one new location.

Proposed restoration projects were identified in the Deep Creek Restoration Plan, some of which have already been implemented. Of the 2.8 miles of road within the sediment delivery zone of streams that were decommissioned in the Lower Deep Creek Subwatershed as part of the Deep Creek Restoration Plan, 0.7 miles of the FS 4200-600 and 0.4 miles of the FS 4200-603 decommissioned roads are planned to be reopened as Class I trails in Alternative 2. The FS 4200-600 road parallels Big Spring Creek, a fish-bearing perennial stream, for approximately 0.3 miles and parallels and intermittent tributary to Big Spring Creek for approximately 0.4 miles. The FS 4200-603 road parallels Buck Hollow, a perennial stream, for approximately 0.4 miles. The reopened portion of the FS 4200-603 road is located on high slope erosion hazard. Approximately a third of the reopened portion of the FS 4200-600 road is located on high slope erosion hazard, a third is located on moderate slope erosion hazard, and a third is located on low slope erosion hazard. Stream crossings would be installed with both of these road segments. Based on design criteria, implementation of the Alternative 2 trail system would require installation of a culvert or bridge at these stream crossing locations.

Flow and Sediment Regimes

Designating Class I and III trails and constructing new trails and stream crossings at the locations proposed in Alternative 2 in the Lower Deep Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the effects of flow and sediment regime on the subwatershed by increasing road/trail densities and reopening decommissioned roads. By adding approximately 7.0 miles of trail to the overall subwatershed road/trail network, the road/trail densities increase from 3.0 to 3.3 miles per square mile, both densities are low relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively low (2.0 miles per square mile) and by adding four new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Lower Deep Creek Subwatershed, the overall stream crossing density increases from 1.8 to 2.0 crossings per square mile, both of these densities are low relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Lower Deep Creek Subwatershed. Based on relatively low drainage densities, slight increases to the road/trail density and stream crossings density across the Lower Deep Creek Subwatershed are likely to have little effect on peak flows, with the potential for an immeasurable increase relative to the no action alternative.

Sediment/Turbidity

Designating Class I and III trails and constructing new trails and stream crossings at the locations proposed in Alternative 2 in the Lower Deep Creek Subwatershed may improve somewhat the bank stability conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the sediment delivery to streams at site specific locations.

Approximately 1.5 miles of trail would be added within 300 feet of an intermittent or perennial stream, four new stream crossings would be added, and 0.5 miles of trail are proposed that intersect

GDEs or their RHCAs within the forest boundary portion of the subwatershed. In addition, approximately 1.1 miles of decommissioned roads within 300 feet of streams are proposed to be reopened as Class I trails as part of Alternative 2. By adding approximately 1.5 miles of trail to the road/trail network within the sediment delivery zone of streams in the Lower Deep Creek Subwatershed, the road/trail densities increase from 5.5 to 5.8 miles per square mile, both of these densities are low relative to the other Ochoco Summit project area Subwatersheds analyzed. The addition of virtually 0.5 new miles of trail within GDEs and associated RHCAs increases road densities in GDEs from 7.6 to 8.1 miles per square mile, both of which are high relative to the other subwatersheds.

Existing bank stability in surveyed streams in the Lower Deep Creek Subwatershed is relatively good and met LRMP standards in the Crazy Creek in 2010 and in Deep Creek in 1999. The dominant channel types of streams in Crazy Creek are B4 channel types, which have moderate channel sensitivity and excellent recovery potential. The dominant channel types of streams in Deep Creek are C4 channel types, which have very high channel sensitivity and good recovery potential. At the location of the new Class I trail stream crossing on Deep Creek, the channel type indicates that the channel should have very high streambank erosion potential. Since peakflow increases are expected to be minor and design criteria require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, overall bank stability is likely to be maintained. At site specific locations bank stability and increased sediment delivery may be of concern by reopening decommissioned roads that cross and parallel Big Springs Creek and Buck Hollow, a portion of which are on a High Slope Erosion Hazard slope.

Based on site specific sediment delivery and bank stability concerns, Alternative 2 proposed trails have the potential to increases sediment delivery to streams and unstable banks at site specific locations, which would potentially add to sediment and turbidity increases in Deep Creek.

Upper Ochoco Creek Watershed

Alternative 2 proposes approximately 12 miles of Class I trail and approximately 1.0 miles of Class III trail within the Upper Ochoco Creek Watershed. Approximately 5.0 miles of Class I trail are proposed on existing National Forest System Roads. Approximately 6.9 miles of Class I trail and 1.0 mile of Class III trail would be new trails and not already part of the existing National Forest System road network. Approximately 0.1 miles of new trail and 0.9 miles of trail on existing roads in the Upper Ochoco Creek Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. A total of four existing intermittent and perennial stream crossings are proposed for use.

Upper Marks Creek Subwatershed

Within the Upper Marks Creek Subwatershed, approximately 4.5 miles of Class I trail are located on existing National Forest System Road. Approximately 5.0 miles of Class I trail and 0.3 miles of Class III new trail are proposed to be constructed as part of Alternative 2. Alternative 2 proposes for Class I trails to cross perennial and intermittent streams on existing roads at four locations. Class III trails are not proposed to cross perennial and intermittent streams at new or existing locations.

Flow and Sediment Regimes

Designating Class I and Class III trails and constructing new trails and stream crossings at the locations proposed in Alternative 2 in the Upper Marks Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the effects of flow and sediment regime on the subwatershed by increasing overall road/trail densities. By adding approximately 5.3 miles of new trail to the overall subwatershed road/trail network, the road/trail densities increase from 4.1 to 4.4 miles per square mile, both of which are high relative to the overall

range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively moderate (2.4 miles per square mile); however, no new stream crossings are proposed in the Upper Marks Creek Subwatershed, effectively maintaining the relatively high stream crossing density of 5.0 crossings per square mile. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Upper Marks Creek Subwatershed. Moderate drainage densities, the addition of no new stream crossings, and increases to the road/trail densities across the Upper Marks Creek Subwatershed are likely to have little effect on peak flows, with the potential for an immeasurable increase relative to the no action alternative.

Sediment/Turbidity

Designating Class I and III trails and constructing new trails and stream crossings at the locations proposed in Alternative 2 in the Upper Marks Creek Subwatershed may improve somewhat the bank stability conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the sediment delivery to streams. In the short-term with the implementation of Alternative 2 in this subwatershed, sediment delivery would increase; however, in the long-term, once most user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition.

Approximately 0.1 miles of trail would be added within 300 feet of an intermittent or perennial stream, no new stream crossings would be added, and 0.4 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 0.1 miles of trail to the road/trail network within the sediment delivery zone of streams in the Upper Marks Creek Subwatershed, the road/trail densities are maintained at 6.2 miles per square mile, which are moderate relative to the other Ochoco Summit project area Subwatersheds analyzed. The addition of 0.4 miles of trail within GDEs and associated RHCAs increases the road densities slightly in GDEs from 6.6 to 6.7 miles per square mile, which are moderate relative to the other subwatersheds. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Upper Marks Creek Subwatershed. Based on only slight increases in road densities in GDEs and near streams and no new stream crossings, sediment delivery effects are expected to be negligible based on Alternative 2.

Existing bank stability in surveyed stream reaches in the Upper Marks Creek Subwatershed within the project boundary is relatively good and met LRMP standards in surveyed reaches of Crystal Creek in 2003 and in the only stream reach of Marks Creek within the project boundary with bank stability data from 2010. Based on Level II stream surveys, the dominant channel type of streams in the Crystal Creek is an E4 channel type and in Marks Creek in the 2010 surveyed reach is a C4 channel type, both of which have very high channel sensitivity and good recovery potential. Since peakflow increases are expected to be minor and no new stream crossings are proposed, overall bank stability is likely to be maintained.

Based on a negligible increase in the road/trail density within the sediment delivery zone, a slight increase in the road density in GDEs, no new stream crossings, as well as overall moderate Slope Erosion Hazard Conditions, Alternative 2 proposed new trails are not likely to measurably increase sediment delivery to streams and GDEs nor decrease bank stability.

Alternative 2 Summary

Alternative 2, the Proposed Action, focuses on designating motorized trails and supporting areas, in conjunction with opportunities that would remain on mixed use roads identified on the MVUM. Alternative 2 proposes a total of 69 miles of Class I vehicle (ATV) trails or roads, 48 miles of Class II vehicle (jeep, small truck and buggy) trail/roads, and 52 miles of Class III vehicle (motorcycle) trail/roads. These projects would result in more effects to the streams and watersheds within the Ochoco Summit project area as compared to Alternative 1, the no action alternative. During trail

construction and prior to vegetation re-establishment (approximately 2-3 years), with the implementation of Alternative 2, sediment delivery would increase; however, once user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition based on implementation of design criteria and water quality best management practices (see Water Quality and Aquatic Organisms and Soils section under Resource Protection Measures in Chapter 2 of this document) .

Alternative 3

Alternative 3 was developed in response to potential issues related to how the trail system could impact water quality, big game habitat, and fish habitat, as well as potential conflict between motorized and non-motorized recreation. This alternative is intended to provide motorized trails and areas at a lesser scale to reduce potential for impacts to water quality, fish and wildlife, and to reduce conflict between motorized and non-motorized recreational use. Alternative 3 proposes a total of 38 miles of Class I vehicle (ATV) trails or roads and 62 miles of Class III vehicle (motorcycle) trail/roads. These projects would result in more effects to the streams and watersheds within the Ochoco Summit project area as compared to Alternative 1, the no action alternative. During trail construction and prior to vegetation re-establishment (approximately 2-3 years), with the implementation of Alternative 3, sediment delivery would increase; however, once user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition based on implementation of design criteria and water quality best management practices (see Water Quality and Aquatic Organisms and Soils section under Resource Protection Measures in Chapter 2 of this document). Overall, alternative 3 would result in less effect to stream and GDE water quality across the Ochoco Summit project area than any of the other alternatives.

Alternative 3 addresses the Purpose and Need as outlined in Chapter 1 by proposing to develop a trail network that includes approximately 88 miles of proposed OHV trail and 13 miles of open National Forest System roads that connect trail segments or contribute to the network by connecting trail segments or by enhancing loop opportunities/options for trail users. The motorized trails would be open for use by specified vehicle type, seasonally between June 1 and September 30 of each year, except on Paulina Ranger District, where trails would close at the beginning of the restriction period specified for the Rager Cooperative Travel Management Area, and would remain closed until June 1 of each year. This alternative features several interconnected trails systems.

Effects Common to All Watersheds

Flow and Sediment Regimes

In the long-term, this alternative would have an overall beneficial impact on flow and sediment regimes in the Ochoco Summit project area Subwatersheds relative to the historic allowance of OHV cross-country travel. During trail construction and prior to vegetation re-establishment (approximately 2-3 years), with the implementation of Alternative 3, sediment delivery would increase; however, once user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition based on implementation of design criteria and water quality best management practices (see Water Quality and Aquatic Organisms and Soils section under Resource Protection Measures in Chapter 2 of this document). Relative to OHV cross-country travel, connectivity of roads and trails with streams would ultimately be lessened resulting in decreased peak flow magnitudes. However, relative to the no action alternative, proposed trails in Alternative 3 would increase the overall road/trail density and stream crossing density. Increased road/trail densities have the potential to in effect increase drainage density, resulting in increased connectivity and peak flow magnitudes.

Sediment/Turbidity

Overall, this alternative would reduce impacts relative to water quality, in particular sediment and turbidity. In the long-term, relative to OHV cross-country travel, sediment and turbidity related water quality would be maintained or slightly improved through an overall reduction in the number of stream and wetland crossing locations, improved stream crossing types, improved trail drainage, reduction in the miles of trail in the vicinity of perennial and intermittent streams, and anticipated decreased peak flow magnitudes.

As compared to historic OHV cross-country travel impacts, streambank conditions are expected to maintain or slightly improve over time with the implementation of Alternative 3. Relative to OHV cross-country travel, fewer stream crossings would occur within all subwatersheds and culverts or bridges would be installed at all new perennial and intermittent stream crossings. By reducing the number of crossing locations relative to cross-country travel and by not allowing fords, direct streambank impacts would be reduced. Alternative 3 would have more impact on streambanks as compared to the no action alternative with increased stream crossings and potential disturbance during culvert or bridge installation. Alternative 3 would have less of an impact to streambanks as compared to Alternative 2 with fewer stream crossings, less changes to the sediment and flow regimes, and with the absence of Class II trails. Areas that are currently entrenched (G and F-type channels) would continue to adjust and may take several decades to become stable with vegetation. Sediment yield from these entrenched systems would continue to exist, but would decline as streambanks adjust slope and become vegetated.

As the effects of the implementation of the Travel Management Decision that omits cross-country travel across the Ochoco National Forest are realized, impacts to Groundwater-Dependant Ecosystems (GDEs) in the form of wetlands, wet meadows, and springs would be reduced even with the designation of the trail network in Alternative 3. User created trails across GDEs would naturally revegetate over time and trails that cross GDEs would have minimal effect through the implementation of the design criteria. Design criteria state that trails would either be rereouted to “avoid meadows, seeps, and springs” or “puncheon stringers” would need to be installed that would elevate the trail above the GDE. Overall, however, Alternative 3 would have slightly more effect on GDEs through increased road/trail densities in and within GDE RHCAs through increased disturbance levels compared to the no action alternative.

Overall, Alternative 3 would result in reduced sediment delivery to streams through improved trail drainage, periodic trail maintenance, reduced trail densities near streams, and reduced peak flows as compared to historic OHV cross-country uses in the Ochoco Summit project area. User-created trails that have been created over time do not have proper drainage, are not maintained, and cross over a larger portion of the landscape including across streams. By designating the trail system in Alternative 3, erosion and sediment delivery to the stream channel is mitigated by the design criteria that require outlsloping and hardening approaches to stream crossing, installing rolling dips to disperse water from the trail, by reducing the number of locations where OHVs can cross intermittent and perennial streams, and by reducing the density of trails within the sediment delivery zone (300 feet). Reduced peak flows also dissipate the effects of sediment delivery to streams by reducing the potential for rilling to occur along the trails or where flow is diverted off the trail onto the hillslope above the stream channel.

Overall, this alternative would be consistent with the water goals and maintaining cutbank levels to below 20 percent as outlined in the LRMP. This alternative would be consistent with the Riparian Management Goal of maintaining bank stability greater than 80 percent outlined in INFISH and with the RMO. This alternative would protect designated beneficial uses and would be consistent with the Clean Water Act and Executive Orders 11988, 11990, and 12088. Site specific locations in the Deep Creek Watershed, however, would not be consistent with the purpose and need of the Deep Creek

Restoration and potentially resulting in turbidity increases in Deep Creek. Cumulative turbidity increases of ten percent or more do not meet LRMP water quality standards and guidelines.

Lower Beaver Creek Watershed

Alternative 3 proposes 9.1 miles of Class III trail within the Lower Beaver Creek Watershed. Approximately, 4.1 miles of the total are proposed on existing National Forest System Roads and approximately 5.0 miles would be new trail construction. Approximately 0.2 miles of new trail and 1.0 miles of trail on existing roads in the Lower Beaver Creek Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. A total of three existing stream crossings are proposed for use, all of which cross intermittent streams.

North Wolf Creek Subwatershed

Within the North Wolf Creek Subwatershed, approximately 3.2 miles of existing National Forest System Road, mostly closed roads, and approximately 1.2 miles of new trail are proposed to be constructed as part of Alternative 3. The 1.2 miles of new trail are predominately along ridges and in areas not adjacent to stream channels.

Flow and Sediment Regimes

Designating Class III trails in the Alternative 3 proposed locations in the North Wolf Creek Subwatershed would have the effect of improving flow and sediment regime conditions in the long-term relative to past cross-country travel and would essentially maintain flow and sediment conditions relative to the no action alternative. By adding approximately 1.2 miles of trail to the overall subwatershed road/trail network, the road/trail densities increase somewhat from 3.0 to 3.3 miles per square mile, however, relative to the overall range in existing road densities across the Ochoco Summit project area, the rating for road/trail densities remains as moderate. Drainage densities are relatively high (2.9 miles per square mile); however, by not adding any new intermittent or perennial stream crossings in the North Wolf Creek Subwatershed, the overall stream crossing density remains the same at 3.3 crossings per square mile with a moderate rating. In addition, all of the trails proposed within this subwatershed as part of Alternative 3 are Class III trails, designed for 24-inch wide motorcycle clearance, which would have much less disturbance and potential for capture of drainage as compared to the wider Class I and Class II trails. Since the majority of the trails proposed in the North Wolf Subwatershed are located on existing roads and the new trails do not cross intermittent or perennial stream channels, this minor increase in road/trail densities across the subwatershed are not likely to increase the flow and sediment regime relative to the existing condition.

Sediment/Turbidity

Designating Class III trails in the Alternative 3 proposed locations in the North Wolf Creek Subwatershed would have the effect of improving water quality conditions in the long-term relative to past cross-country travel and would essentially maintain water quality conditions relative to the no action alternative.

Approximately 0.2 miles of trail would be added within 300 feet of an intermittent stream, no new stream crossings would be added, and no new trail is proposed that crosses known GDEs within the forest boundary portion of the subwatershed. By adding approximately 0.2 miles of trail to the road/trail network within the sediment delivery zone of streams in the North Wolf Creek Subwatersheds, the road/trail densities increase slightly from 6.3 to 6.4 miles per square mile, however, relative to the overall range in existing road densities across the Ochoco Summit project area, the rating for road/trail densities within 300 feet of streams remains as moderate. Slope Erosion Hazard Ratings are relatively high; however, by not adding any new intermittent or perennial stream crossings and only minimal trail length near streams in the North Wolf Creek Subwatershed, the

additional erosion potential from the 0.2 additional miles of trail is not expected to measurably increase sediment delivery to the streams or stream turbidity in the North Wolf Creek Subwatershed.

Upper North Fork Crooked River Watershed

Alternative 3 proposes approximately 15 miles of Class I trail and approximately 8.0 miles of Class III trail within the Upper North Fork Crooked River Watershed. Approximately 5.3 miles of Class I trail and 4.9 miles of Class III trail are proposed on existing National Forest System Roads. Approximately 9.5 miles of Class I trail and 3.1 miles of Class III trail would be new trails not already part of the existing National Forest System road network. Approximately 2.8 miles of new trail and 2.1 miles of trail on existing roads in the Upper North Fork Crooked River Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. A total of 13 new and 3 existing intermittent and perennial stream crossings are proposed for use.

Elliot Creek Subwatershed

Within the Elliot Creek Subwatershed, approximately 3.7 miles of Class I trail are located on existing National Forest System Road and approximately 3.3 miles of Class I new trail are proposed to be constructed as part of Alternative 3. Alternative 3 proposes for Class I trails to cross perennial and intermittent streams at one location at an existing stream crossing on existing roads and to cross perennial and intermittent streams with new trails at four locations.

The Maxwell Fire BAER rehabilitation road treatments, included rehabilitation work on segments of two roads within the Elliot Creek Subwatershed, FS 2200-505 and FS 2200-500. In Alternative 3, proposed trail locations do no overlap either FS 2200-500 or FS 2200-505.

Flow and Sediment Regimes

Designating Class I trails and constructing new trails and stream crossings at the locations proposed in Alternative 3 in the Elliot Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the effects of flow and sediment regime on the subwatershed by increasing road/trail densities and stream crossing densities overall. By adding approximately 3.3 miles of trail to the overall subwatershed road/trail network, the road/trail densities increase somewhat from 3.3 to 3.5 miles per square mile. Relative to the overall range in existing road densities across the Ochoco Summit project area, the rating for road/trail densities increases from low to moderate. Drainage densities are relatively high (2.8 miles per square mile) and by adding four new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Elliot Creek Subwatershed, the overall stream crossing density increases from 3.4 to 3.7 crossings per square mile, bringing the overall rating up from moderate to high relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are high in the vicinity of streams in the Elliot Creek Subwatershed, which can make interconnectivity of roads and streams more likely, potentially resulting in increased peak flows in streams. Increases in the road/trail and stream crossing densities across the Elliot Creek Subwatershed, in combination with poor slope erosion hazard conditions, potentially increases the flow and sediment regime relative to the existing condition.

Sediment/Turbidity

Constructing new Class I and III trails and stream crossings at the locations proposed in Alternative 3 in the Elliot Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the effects of flow and sediment regime on the subwatershed by increasing road/trail densities and stream crossing densities overall. During trail construction and prior to vegetation re-establishment (approximately 2-3 years), with the implementation of Alternative 3, sediment delivery

would increase; however, once user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition based on implementation of design criteria and water quality best management practices (see Water Quality and Aquatic Organisms and Soils section under Resource Protection Measures in Chapter 2 of this document).

Approximately 0.8 miles of trail would be added within 300 feet of an intermittent stream, four new stream crossings would be added, and 0.2 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 0.8 miles of trail to the road/trail network within the sediment delivery zone of streams in the Elliot Creek Subwatershed, the road/trail densities increase from 4.3 to 4.5 miles per square mile, both ratings are low relative to the overall range in existing road densities across the Ochoco Summit project area. The addition of 0.2 miles of trail within GDEs and associated RHCAs raises road densities in GDEs from approximately 2.8 to 3.0 miles per square mile, maintaining a low rating relative to other project subwatersheds. Slope Erosion Hazard Ratings are relatively high, making erosion and potentially sediment delivery more likely in the subwatershed. Sediment delivery estimates indicate an addition of a relatively moderate amount of sediment delivery to the no action alternative (see Aquatic Species section).

Existing bank stability in Fox Creek, the only stream in the Elliot Creek Subwatershed with a Level II stream survey conducted, is relatively good and met LRMP standards as of 2002. In addition, the dominant channel type of Fox Creek has moderate channel sensitivity and recovery potential. Other reaches of Fox Creek are classified as A4 and C4 channel types. A4 channel types generally have extreme channel sensitivity and very poor recovery potential, while C4 channel types generally have very high channel sensitivity and good recovery potential. No new trails are proposed to cross or parallel Fox Creek. Assuming that other streams in the Elliot Creek Subwatershed exhibit similar dominant channel type conditions and the implementation of design criteria that require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, bank stability is likely to be maintained, unless increased peak flows result from increases in road/trails and stream networks.

Based on high Slope Erosion Hazard conditions, increases in both road/trail densities within the sediment delivery zone, and increases in stream crossing densities, Alternative 3 proposed new trails have the potential to increases sediment delivery to streams; however, banks stability is likely to be maintained.

Howard Creek Subwatershed

Within the Howard Creek Subwatershed, approximately 1.6 miles of Class I trail are located on existing National Forest System Road and approximately 6.2 miles of new Class I trail are proposed to be constructed as part of Alternative 3. Alternative 3 proposes for Class I trails to cross perennial and intermittent streams with new trails at four locations.

Flow and Sediment Regimes

Designating Class I trails and constructing new trails and stream crossings at the locations proposed in Alternative 3 in the Howard Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the effects of flow and sediment regime on the subwatershed by increasing road/trail densities and stream crossing densities overall. By adding approximately 6.2 miles of trail to the overall subwatershed road/trail network, the road/trail densities increase from 4.6 to 5.0 miles per square mile, both of which are high relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively moderate (2.2 miles per square mile) and by adding four new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Howard Creek Subwatershed, the overall stream

crossing density increases from 4.1 to 4.4 crossings per square mile, both of these densities are high relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Howard Creek Subwatershed. Increases to the already high road/trail and stream crossing densities across the Howard Creek Subwatershed have the potential to increase peak flows and shorten response times relative to the existing condition.

Sediment/Turbidity

Designating Class I trails and constructing new trails and stream crossings at the locations proposed in Alternative 3 in the Howard Creek Subwatershed may improve somewhat the bank stability and sediment delivery conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the sediment delivery to streams. During trail construction and prior to vegetation re-establishment (approximately 2-3 years), with the implementation of Alternative 3, sediment delivery would increase; however, once user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition based on implementation of design criteria and water quality best management practices (see Water Quality and Aquatic Organisms and Soils section under Resource Protection Measures in Chapter 2 of this document).

Approximately 1.4 miles of trail would be added within 300 feet of an intermittent stream, four new stream crossings would be added, and 0.8 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 1.4 miles of trail to the road/trail network within the sediment delivery zone of streams in the Howard Creek Subwatershed, the road/trail densities increase from 8.2 to 8.6 miles per square mile, both of these densities are high relative to the other Ochoco Summit project area Subwatersheds analyzed. The addition of 0.8 miles of trail within GDEs and associated RHCAs raises road densities in GDEs from approximately 6.9 to 7.2 miles per square mile, bringing the overall rating up from moderate to high relative to the other subwatersheds. Sediment delivery estimates indicate an addition of a relatively low amount of sediment delivery to the no action alternative (see Aquatic Species section).

Existing bank stability in surveyed streams in the Howard Creek Subwatershed is relatively good and met LRMP standards between 1994 and 2001. In addition, the dominant channel types of streams in the subwatershed are B4 channel types, which have moderate channel sensitivity and excellent recovery potential. At the location of the new Class I trail stream crossing on Howard Creek, the channel type indicates that the channel should have low streambank erosion potential. No channel type information was gathered for the remaining three new stream crossings in the Howard Creek Subwatershed. Dominant channel types in Howard Creek, South Fork Howard Creek, and West Fork Howard Creek indicate moderate channel sensitivity and excellent recovery potential, whereas, dominant channel type in East Fork Howard Creek indicate very high channel sensitivity and good recovery potential of the stream. Assuming that other streams in the Howard Creek Subwatershed exhibit similar dominant conditions to Howard Creek and the implementation of design criteria that require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, bank stability is likely to be maintained, unless increased peak flows result from increases in road/trails and stream networks.

Based on increases in both road/trail densities within the sediment delivery zone and within and near GDEs, Alternative 3 proposed new trails have the potential to increases sediment delivery to streams; however, banks stability is likely to be maintained.

Peterson Creek Subwatershed

No trails are proposed within the Peterson Creek Subwatershed for Alternative 3.

Flow and Sediment Regimes

By proposing no OHV trails in Alternative 3 in the Peterson Creek Subwatershed, flow and sediment regimes would improve more quickly with the exclusion of cross-country OHV travel. All road/trail densities and stream crossing densities would remain the same in the Peterson Creek Subwatershed with the implementation of Alternative 3. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Peterson Creek Subwatershed. In the long-term, flow and sediment regime conditions in the Peterson Creek Subwatershed are expected to improve more quickly than in Alternatives 2 and 4, similar to the no action alternative.

Sediment/Turbidity

By proposing no OHV trails in Alternative 3 in the Peterson Creek Subwatershed, sediment/turbidity conditions would improve more quickly with the exclusion of cross-country OHV travel. All road/trail densities within the sediment delivery zone of streams and GDEs and associated RHCAs, as well as stream crossing densities would remain the same in the Peterson Creek Subwatershed with the implementation of Alternative 3. In the long-term, sediment delivery and banks stability conditions in the Peterson Creek Subwatershed are expected to improve more quickly than in Alternatives 2 and 4, similar to the no action alternative.

Porter Creek Subwatershed

Within the Porter Creek Subwatershed, approximately 4.9 miles of Class III trail located on existing National Forest System Road. Approximately 3.1 miles of Class III new trail are proposed to be constructed as part of Alternative 3. No Class I or II trails are proposed to cross intermittent or perennial stream channels in Alternative 3. Class III trails are proposed to cross perennial and intermittent streams at five new locations.

Flow and Sediment Regimes

Designating Class III trails and constructing new trails and stream crossings at the locations proposed in Alternative 3 in the Porter Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the effects of flow and sediment regime on the subwatershed by increasing road/trail densities and stream crossing densities overall. By adding approximately 3.1 miles of trail to the overall subwatershed road/trail network, the road/trail densities increase from 3.7 to 3.9 miles per square mile, maintaining a rating of moderate relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively high (2.8 miles per square mile) and by adding five new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Porter Creek Subwatershed, the overall stream crossing density increases from 4.0 to 4.3 crossings per square mile, both of these densities are high relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are low in the vicinity of streams in the Porter Creek Subwatershed. Slight increases to the road/trail density and already high stream crossing density across the Porter Creek Subwatershed in combination with all trails being Class III (motorcycle) have the potential to slightly increase impacts to flow and sediment regimes in the short-term (i.e. approximately 2-3 years) relative to the existing condition.

Sediment/Turbidity

Designating Class III trails and constructing new trails and stream crossings at the locations proposed in Alternative 3 in the Porter Creek Subwatershed may improve somewhat the bank stability and sediment delivery conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the sediment delivery to streams. During trail construction and prior to vegetation re-establishment (approximately 2-3 years), with the

implementation of Alternative 3, sediment delivery would increase; however, once user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition based on implementation of design criteria and water quality best management practices (see Water Quality and Aquatic Organisms and Soils section under Resource Protection Measures in Chapter 2 of this document).

Approximately 0.6 miles of trail would be added within 300 feet of an intermittent stream, five new stream crossings would be added, and essentially no miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 0.6 miles of trail to the road/trail network within the sediment delivery zone of streams in the Porter Creek Subwatershed, the road/trail densities increase from 7.4 to 7.5 miles per square mile, both of these densities are high relative to the other Ochoco Summit project area Subwatersheds analyzed. Slope Erosion Hazard conditions for the Porter Creek Subwatershed are low overall, somewhat reducing the risk and magnitude of potential sediment delivery increases for the proposed trail network in Alternative 3. Sediment delivery estimates indicate an addition of a relatively moderate amount of sediment delivery to the no action alternative (see Aquatic Species section).

Existing bank stability in surveyed streams in the Porter Creek Subwatershed was relatively good and met LRMP standards in Easter Porter Creek in 1995 and in the top and bottom reaches of Porter Creek in 2006-2007. Bank stability in the middle reach of Porter Creek in 2007 slightly exceeded LRMP standards with approximately 23 percent of the stream length unstable. No trails are proposed to cross Porter Creek on the reach of stream that is not meeting LRMP standards of no more than 20 percent unstable banks. Dominant channel types in Porter Creek indicate moderate channel sensitivity and excellent recovery potential. Assuming that other streams in the Porter Creek Subwatershed exhibit similar dominant conditions to Porter Creek and implementation of design criteria that require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, bank stability is likely to be maintained.

Based on increases stream crossing density and slight increases in in road/trail densities within the sediment delivery zone, Alternative 3 proposed new trails have the potential to increase sediment delivery to streams as described in the Aquatic Species section; however, bank stability is likely to be maintained.

Deep Creek Watershed

Alternative 3 proposes approximately 43 miles of Class III trail within the Deep Creek Watershed. Approximately 24 miles of Class III trail are proposed on existing National Forest System Roads. Approximately 19 miles of Class III trail would be new trails and not already part of the existing National Forest System road network. Approximately 2.6 miles of new trail and 7.0 miles of trail on existing roads in the Deep Creek Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. A total of 11 new and 13 existing intermittent and perennial stream crossings are proposed for use.

Jackson Creek Subwatershed

Within the Jackson Creek Subwatershed, approximately 13 miles of Class III trail are located on existing National Forest System Road. Approximately 6.2 miles of new Class III trail are proposed to be constructed as part of Alternative 3. Alternative 3 proposes for Class III trails to cross perennial and intermittent streams with new trails at six locations and to cross perennial and intermittent streams on existing roads at six locations.

Flow and Sediment Regimes

Designating Class III trails and constructing new trails and stream crossings at the locations proposed in Alternative 3 in the Jackson Creek Subwatershed may improve somewhat the flow and sediment

regime conditions in the long-term (i.e. 2-3 years post-construction) relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the effects of flow and sediment regime on the subwatershed by increasing overall road/trail and stream crossing densities. By adding approximately 6.2 miles of new trail to the overall subwatershed road/trail network, the road/trail densities increase from 3.7 to 3.8 miles per square mile, both ratings are moderate relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively low (1.8 miles per square mile) and by adding six new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Jackson Creek Subwatershed, the overall stream crossing density increases from 1.8 to 2.0 crossings per square mile, both of these densities are low relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Jackson Creek Subwatershed. Based on relatively low drainage and stream crossing densities, slight increases to the road/trail density and stream crossings density across the Jackson Creek Subwatershed are likely to have a negligible effect on peak flows, with the potential for an immeasurable increase relative to the no action alternative.

Sediment/Turbidity

Designating Class III trails and constructing new trails and stream crossings at the locations proposed in Alternative 3 in the Jackson Creek Subwatershed may improve somewhat the bank stability conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the sediment delivery to streams. In the short-term (i.e. approximately 2-3 years post-construction) with the implementation of Alternative 3 in this subwatershed, sediment delivery would increase; however, in the long-term, once user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition assuming extensive historic cross-country OHV trail systems exist.

Approximately 0.9 miles of trail would be added within 300 feet of an intermittent or perennial stream, six new stream crossings would be added, and 0.4 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 0.9 miles of trail to the road/trail network within the sediment delivery zone of streams in the Jackson Creek Subwatershed, the road/trail densities increase from 6.1 to 6.2 miles per square mile, both of these densities are moderate relative to the other Ochoco Summit project area Subwatersheds analyzed. The addition of 0.4 miles of trail within GDEs and associated RHCAs increases the road densities in GDEs from 5.6 to 5.7 miles per square mile, which are low relative to the other subwatersheds. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Jackson Creek Subwatershed. Estimates of sediment delivery in the Aquatic Species section indicate that Alternative 3 has the potential to add a moderate amount of sediment delivery relative to the no action alternative (Alternative 1), but less than Alternatives 2 and 4.

Existing bank stability in surveyed streams in the Jackson Creek Subwatershed is relatively good and met LRMP standards in Happy Camp Creek and Jackson Creek from 1998 and 2010. Based on Level II stream surveys, the dominant channel types of streams in Happy Camp Creek are E4 channel types and in Jackson Creek are C4 channel types, which have very high channel sensitivity and good recovery potential. At the location of the new Class III stream crossing location on Jackson Creek, the channel type indicates moderate streambank erosion potential. Since peakflow increases are expected to be negligible, design criteria require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, and based on channel type conditions, overall bank stability is likely to be maintained.

Based on slight increases in both stream crossing and road/trail densities within the sediment delivery zone and in GDEs, as well as overall moderate Slope Erosion Hazard Conditions, Alternative 3

proposed new trails have the potential to moderately increase sediment delivery to streams and GDEs; however, banks stability is likely to be maintained.

Little Summit Prairie Creek Subwatershed

Within the Little Summit Prairie Creek Subwatershed, approximately 5.6 miles of Class III trail are located on existing National Forest System Road. Approximately 7.0 miles of Class III new trail are proposed to be constructed as part of Alternative 3. Class III trails are proposed to cross perennial and intermittent streams at one new location and to cross perennial and intermittent streams at two locations at existing stream crossings on existing roads.

Flow and Sediment Regimes

Designating Class III trails and constructing new trails and stream crossings at the locations proposed in Alternative 3 in the Little Summit Prairie Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term (i.e. approximately 2-3 years post-construction relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the effects of flow and sediment regime on the subwatershed by increasing overall road/trail and stream crossing densities. By adding approximately seven miles of new trail to the overall subwatershed road/trail network, the road/trail densities increase from 3.8 to 4.1 miles per square mile, bringing the rating from moderate to high relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively low (2.2 miles per square mile) and by adding one new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Little Summit Prairie Creek Subwatershed, the overall stream crossing density increases from 2.5 to 2.6 crossings per square mile, both of these densities are moderate relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Little Summit Prairie Creek Subwatershed. Based on relatively low drainage densities, increases to the road/trail density and stream crossings density across the Little Summit Prairie Creek Subwatershed are likely to have little effect on peak flows, with the potential for an immeasurable increase relative to the no action alternative.

Sediment/Turbidity

Designating Class III trails and constructing new trails and stream crossings at the locations proposed in Alternative 3 in the Little Summit Prairie Creek Subwatershed may improve somewhat the bank stability conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the sediment delivery to streams. During trail construction and prior to vegetation re-establishment (approximately 2-3 years), with the implementation of Alternative 3, sediment delivery would increase; however, once user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition based on implementation of design criteria and water quality best management practices (see Water Quality and Aquatic Organisms and Soils section under Resource Protection Measures in Chapter 2 of this document).

Approximately 0.6 miles of trail would be added within 300 feet of an intermittent or perennial stream, one new stream crossings would be added, and 0.4 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 0.6 miles of trail to the road/trail network within the sediment delivery zone of streams in the Little Summit Prairie Creek Subwatershed, the road/trail densities increase from 7.4 to 7.5 miles per square mile, both of these densities are high relative to the other Ochoco Summit project area Subwatersheds analyzed. The addition of 0.4 miles of trail within GDEs and associated RHCAs increases the road densities in GDEs from 5.1 to 5.4 miles per square mile, which are low relative to the other subwatersheds. Overall, slope erosion hazard conditions are moderate in the vicinity of

streams in the Little Summit Prairie Creek Subwatershed. Estimates of sediment delivery in the Aquatic Species section indicate that Alternative 3 has the potential to add a low amount of sediment delivery relative to the no action alternative (Alternative 1), the same as Alternatives 2 and 4.

Existing bank stability in surveyed streams in the Little Summit Prairie Creek Subwatershed is relatively good and met LRMP standards in surveyed reaches of Little Summit Creek and an unnamed tributary in 1998 and 2010. Based on Level II stream surveys, the dominant channel types of streams in the Little Summit Prairie Creek Subwatershed are C4 channel types, which have very high channel sensitivity and good recovery potential. At the location of the new Class I trail stream crossings on Little Summit Creek, the channel type is a B3 channel type, which indicates that the channel should have low streambank erosion potential. Since peakflow increases are expected to be minor, streambank erosion based on channel type at the stream crossing is low, and design criteria require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, overall bank stability is likely to be maintained.

Based on slight increases in both road/trail densities within the sediment delivery zone and in GDEs, as well as overall moderate Slope Erosion Hazard Conditions, Alternative 3 proposed new trails have the potential to slightly increase sediment delivery to streams and GDEs; however, banks stability is likely to be maintained.

Lower Deep Creek Subwatershed

Within the Lower Deep Creek Subwatershed, approximately 5.4 miles of Class III trail are located on existing National Forest System Road and approximately 5.9 miles of new Class III trail are proposed to be constructed as part of Alternative 3. Alternative 3 proposes for Class III trails to cross perennial and intermittent streams with new trails at four locations and to cross perennial and intermittent streams on existing roads at five locations. Relative to Alternative 2, Alternative 3 eliminates all Class I trails and converts most of them to Class III trails.

Proposed restoration projects were identified in the Deep Creek Restoration Plan, some of which have already been implemented. Of the 2.8 miles of road within the sediment delivery zone of streams that were decommissioned in the Lower Deep Creek Subwatershed as part of the Deep Creek Restoration Plan, 0.7 miles of the FS 4200-600 and 0.4 miles of the FS 4200-603 decommissioned roads are planned to be converted to Class III trails in Alternative 3. The FS 4200-600 road parallels Big Spring Creek, a fish-bearing perennial stream, for approximately 0.3 miles and parallels and intermittent tributary to Big Spring Creek for approximately 0.4 miles. The FS 4200-603 road parallels Buck Hollow, a perennial stream, for approximately 0.4 miles. The reopened portion of the FS 4200-603 road is located on high slope erosion hazard. Approximately a third of the converted portion of the FS 4200-600 road is located on high slope erosion hazard, a third is located on moderate slope erosion hazard, and a third is located on low slope erosion hazard. Stream crossings would be installed with both of these road segments. Based on design criteria, implementation of the Alternative 3 trail system would require installation of a culvert or bridge at these stream crossing locations.

Flow and Sediment Regimes

Designating Class III trails and constructing new trails and stream crossings at the locations proposed in Alternative 3 in the Lower Deep Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the effects of flow and sediment regime on the subwatershed by increasing road/trail densities and reopening decommissioned roads. By adding approximately 5.9 miles of trail to the overall subwatershed road/trail network, the road/trail densities increase from 3.0 to 3.3 miles per square mile, both densities are low relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively low (2.0 miles per square mile) and by adding four new intermittent or perennial stream crossings to the

existing number of stream crossings by roads in the Lower Deep Creek Subwatershed, the overall stream crossing density increases from 1.8 to 2.0 crossings per square mile, both of these densities are low relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Lower Deep Creek Subwatershed. Based on relatively low drainage densities, slight increases to the road/trail density and stream crossings density across the Lower Deep Creek Subwatershed are likely to have little effect on peak flows, with the potential for an immeasurable increase relative to the no action alternative. Relative to Alternative 2; however, Class III trails are less likely to increase the connectivity of the drainage and road/trail systems, since motorcycle trails would disturb less area than either ATV or jeep trails.

Sediment/Turbidity

Designating Class III trails and constructing new trails and stream crossings at the locations proposed in Alternative 3 in the Lower Deep Creek Subwatershed may improve somewhat the bank stability conditions in the long-term (i.e. approximately 2-3 years post-construction) relative to past cross-country travel; however, compared to the no action alternative, it could increase the sediment delivery to streams at site specific locations.

Approximately 1.1 miles of trail would be added within 300 feet of an intermittent or perennial stream, four new stream crossings would be added, and 0.5 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. In addition, approximately 1.1 miles of decommissioned roads within 300 feet of streams are proposed to be reopened as Class III trails as part of Alternative 3. By adding approximately 1.1 miles of trail to the road/trail network within the sediment delivery zone of streams in the Lower Deep Creek Subwatershed, the road/trail densities increase from 5.5 to 5.7 miles per square mile, both of these densities are low relative to the other Ochoco Summit project area Subwatersheds analyzed. The addition of virtually 0.5 new miles of trail within GDEs and associated RHCAs increases road densities in GDEs from 7.6 to 8.1 miles per square mile, both of which are high relative to the other subwatersheds. Estimates of sediment delivery in the Aquatic Species section indicate that Alternative 3 has the potential to add a relatively low amount of sediment delivery relative to the no action alternative (Alternative 1), roughly the same as Alternatives 2 and 4.

Existing bank stability in surveyed streams in the Lower Deep Creek Subwatershed is relatively good and met LRMP standards in the Crazy Creek in 2010 and in Deep Creek in 1999. The dominant channel types of streams in Crazy Creek are B4 channel types, which have moderate channel sensitivity and excellent recovery potential. The dominant channel types of streams in Deep Creek are C4 channel types, which have very high channel sensitivity and good recovery potential. At the location of the new Class III trail stream crossing on Deep Creek, the channel type indicates that the channel should have very high streambank erosion potential. Since peakflow increases are expected to be minor and design criteria require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, overall bank stability is likely to be maintained. At site specific locations, bank stability and increased sediment delivery may be of concern by reopening decommissioned roads that cross and parallel Big Springs Creek and Buck Hollow, a portion of which are on a High Slope Erosion Hazard slope.

Based on site specific sediment delivery and bank stability concerns, Alternative 3 proposed trails have the potential to increase sediment delivery to streams overall and unstable banks at site specific locations, which would potentially add to sediment and turbidity increases in Deep Creek.

Upper Ochoco Creek Watershed

Alternative 3 proposes approximately 24 miles of Class I trail within the Upper Ochoco Creek Watershed. Approximately 11 miles of Class I trail are proposed on existing National Forest System Roads. Approximately 12 miles of Class I trail would be new trails and not already part of the

existing National Forest System road network. Approximately 1.1 miles of new trail and 1.7 miles of trail on existing roads in the Upper Ochoco Creek Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. A total of six existing intermittent and perennial stream crossings and six new stream crossings are proposed for use.

Upper Marks Creek Subwatershed

Within the Upper Marks Creek Subwatershed, approximately 11 miles of Class I trail are located on existing National Forest System Road. Approximately 11 miles of new Class I trail are proposed to be constructed as part of Alternative 3. Alternative 3 proposes for Class I trails to cross perennial and intermittent streams on existing roads at six locations and at new stream crossings at six locations.

Flow and Sediment Regimes

Designating Class I trails and constructing new trails and stream crossings at the locations proposed in Alternative 3 in the Upper Marks Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the effects of flow and sediment regime on the subwatershed by increasing overall road/trail densities. By adding approximately 11 miles of new trail to the overall subwatershed road/trail network, the road/trail densities increase from 4.1 to 4.7 miles per square mile, both of which are high relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively moderate (2.4 miles per square mile) and by adding six new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Upper Marks Creek Subwatershed, the overall stream crossing density increases from 5.0 to 5.3 crossings per square mile, both of these densities are high relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Upper Marks Creek Subwatershed. Moderate drainage densities, the addition of six new stream crossings, and increases to the road/trail and stream crossing densities across the Upper Marks Creek Subwatershed have the potential to increase peak flows and shorten response times relative to the existing condition.

Sediment/Turbidity

Designating Class III trails and constructing new trails and stream crossings at the locations proposed in Alternative 3 in the Upper Marks Creek Subwatershed may improve somewhat the bank stability conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the sediment delivery to streams. During trail construction and prior to vegetation re-establishment (approximately 2-3 years), with the implementation of Alternative 3, sediment delivery would increase; however, once user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition based on implementation of design criteria and water quality best management practices (see Water Quality and Aquatic Organisms and Soils section under Resource Protection Measures in Chapter 2 of this document).

Approximately 1.1 miles of trail would be added within 300 feet of an intermittent or perennial stream, six new stream crossings would be added, and 1.4 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 1.1 miles of trail to the road/trail network within the sediment delivery zone of streams in the Upper Marks Creek Subwatershed, the road/trail densities are increased from 6.2 to 6.4 miles per square mile, which are moderate relative to the other Ochoco Summit project area Subwatersheds analyzed. The addition of 1.4 miles of trail within GDEs and associated RHCAs increases the road densities slightly in GDEs from 6.6 to 7.2 miles per square mile, increasing from moderate to high relative to the other subwatersheds. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Upper Marks Creek Subwatershed. Estimates of sediment delivery in the Aquatic Species section indicate that Alternative 3 has the potential to add a relatively moderate

amount of sediment delivery relative to the no action alternative (Alternative 1) and Alternative 2, but less than Alternative 4. Based on increases in stream crossing densities and road densities in GDEs and near streams, as well as sediment delivery estimates, sediment delivery effects are expected to be be moderate in Alternative 3 for the Upper Marks Creek Subwatershed.

Existing bank stability in surveyed stream reaches in the Upper Marks Creek Subwatershed within the project boundary is relatively good and met LRMP standards in surveyed reaches of Crystal Creek in 2003 and in the only stream reach of Marks Creek within the project boundary with bank stability data from 2010. Based on Level II stream surveys, the dominant channel type of streams in the Crystal Creek is an E4 channel type and in Marks Creek in the 2010 surveyed reach is a C4 channel type, both of which have very high channel sensitivity and good recovery potential. The channel type at the proposed new stream crossing on Crystal Creek is an E4, which has high streambank erosion potential. Based on potential increases to peakflow, high streambank erosion potential conditions, and increases stream crossing densities, a potential exists that bank stability could decreases relative to the existing condition. Since the design criteria require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches; however, bank stability is likely to be maintained, unless increased peak flows result from the increases in road/trails and stream networks.

Based on increased road/trail densities, stream crossing densities, road/trail densities in the vicinity of streams and GDEs, and channel type conditions in the Upper Marks Creek Subwatershed; Alternative 3 proposed trails have the potential to increase sediment delivery to streams and unstable banks, which would potentially add to sediment and turbidity increases in Marks Creek.

Alternative 3 Summary

Alternative 3 proposes a total of 38 miles of Class I vehicle (ATV) trails or roads and 62 miles of Class III vehicle (motorcycle) trail/roads. These projects would result in more effects to the streams and watersheds within the Ochoco Summit project area as compared to Alternative 1, the no action alternative. During trail construction and prior to vegetation re-establishment (approximately 2-3 years), with the implementation of Alternative 3, sediment delivery would increase; however, once user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition based on implementation of design criteria and water quality best management practices (see Water Quality and Aquatic Organisms and Soils section under Resource Protection Measures in Chapter 2 of this document). Overall, alternative 3 would result in less effect to stream and GDE water quality across the Ochoco Summit project area than any of the other alternatives.

Alternative 4

Alternative 4 was developed in response to an issue identified during scoping that the proposed action trail system is too small and lacks quality. Alternative 4 includes trails for class I, II and III vehicles over more area and with more miles than the Proposed Action. Alternative 4 proposes a total of 95 miles of Class I vehicle (ATV) trails or roads, 19 miles of Class II vehicle (4x4), and 45 miles of Class III vehicle (motorcycle) trail/roads. In the short-term (i.e. approximately 2-3 years) with the implementation of Alternative 4, sediment delivery would increase; however, in the long-term (i.e. approximately 2-3 years post-construction), even though some user-created trails have revegetated, due to the extensive network of OHV trails added in this alternative, impacts to the flow and sediment regime and sediment/turbidity levels in the streams would likely remain at or in excess of the existing condition. Alternative 4 would result in the largest impact to streams and watersheds within the Ochoco Summit project area as compared to all of the other three alternatives.

Alternative 4 addresses the Purpose and Need as outlined in Chapter 1 by proposing to develop a trail network that includes approximately 158 miles of proposed OHV trail and 53 miles of open National Forest System roads that connect trail segments or contribute to the network by connecting trail

segments or by enhancing loop opportunities/options for trail users. The motorized trails would be open for use by specified vehicle type, seasonally between May 1 and November 1 of each year, except on Paulina Ranger District, where trails would close at the beginning of the restriction period specified for the Rager Cooperative Travel Management Area, and would remain closed until May 1 of each year. This alternative features several interconnected trails systems.

Effects Common to All Watersheds

Flow and Sediment Regimes

Since the exact magnitude of the existing user-created trail system is unknown and due to the extensive trail system proposed in Alternative 4, it is difficult to say whether this alternative would have an overall beneficial impact on flow and sediment regimes in the Ochoco Summit project area Subwatersheds in the long-term. In the short-term (i.e. approximately 2-3 years) with the implementation of Alternative 4, impacts of the addition of trails on the flow and sediment regimes would increase; however, in the long-term (i.e. approximately 2-3 years post-construction), once most user-created trails have revegetated, impacts to watersheds flow and sediment regimes should decrease to some extent. Relative to all three other alternatives, proposed trails in Alternative 4 would have result in the highest increase of the overall road/trail density and stream crossing density. Increased road/trail densities have the potential to in effect increase drainage density, resulting in increased connectivity and peak flow magnitudes.

Sediment/Turbidity

Overall, this alternative would likely not reduce impacts relative to water quality, in particular sediment and turbidity. Depending upon the magnitude of the existing user-created OHV trail system, sediment and turbidity related water quality could either be maintained or further impaired by increased sediment delivery to streams. Since the design criteria require that all perennial and intermittent stream crossings would have culverts or bridges installed with improved drainage on the approaches, stream crossing impacts to streams should be less in Alternative 4 as compared to the existing condition in the long-term, once disturbance from structure installation has subsided and most user-created trails have revegetated.

As compared to historic OHV cross-country travel impacts, streambank conditions are expected to maintain overall over time with the implementation of Alternative 4. Relative to OHV cross-country travel, all intermittent and perennial stream crossings would have culverts or bridges installed with improved drainage on the approaches. By not allowing fords and providing proper drainage structures, direct streambank impacts would be reduced. Alternative 4 would have more impact on streambanks as compared to all other alternatives with increased stream crossings and potential disturbance during culvert or bridge installation. Areas that are currently entrenched (G and F-type channels) would continue to adjust and may take several decades to become stable with vegetation. Sediment yield from these entrenched systems would continue to exist, but would decline as streambanks adjust slope and become vegetated.

As the effects of the implementation of the Travel Management Decision that omits cross-country travel across the Ochoco National Forest are realized, impacts to Groundwater-Dependant Ecosystems (GDEs) in the form of wetlands, wet meadows, and springs would be reduced even with the designation of the trail network in Alternative 4. User created trails across GDEs would naturally revegetate over time and trails that cross GDEs would have minimal effect through the implementation of the design criteria. Design criteria state that trails would either be rereouted to “avoid meadows, seeps, and springs” or “puncheon stringers” would need to be installed that would elevate the trail above the GDE. Overall, however, Alternative 4 would have slightly more effect on GDEs through increased road/trail densities in and within GDE RHCAs through increased disturbance levels compared to the no action alternative.

In the long-term, Alternative 4 would result in maintaining sediment delivery to streams at current levels overall as some user-created trails are revegetated over time. Existing user-created trails with drainage issues, may remain a source of sediment into the future, until actively restored. Even with the implementation of improved trail drainage and periodic trail maintenance, trail densities would likely not decrease relative to existing user-created trail system and some decommissioned roads near streams would be reopened as trails. In the short-term (i.e. approximately 2-3 years) with the implementation of Alternative 4, sediment delivery would increase; however, in the long-term (i.e. approximately 2-3 years post-construction), once most user-created trails have revegetated, sediment delivery to streams should decrease to some extent. User-created trails that have been created over time do not have proper drainage, are not maintained, and cross over a larger portion of the landscape including across streams.

Overall, this alternative would be consistent with the water goals and maintaining cutbank levels to below 20 percent as outlined in the LRMP. This alternative would be consistent with the Riparian Management Goal of maintaining bank stability greater than 80 percent outlined in INFISH and with the RMO. This alternative would protect designated beneficial uses and would be consistent with the Clean Water Act and Executive Orders 11988, 11990, and 12088. Site specific locations in the Deep Creek Watershed, however, would not be consistent with the purpose and need of the Deep Creek Restoration. In addition, due to channel instability resulting from the Maxwell Fire, reopening a road that has been effectively decommissioned that cross Allen Creek, has the potential to affect channel recovery and increase turbidity in Allen Creek. Cumulative turbidity increases of ten percent or more do not meet LRMP water quality standards and guidelines.

Lower Beaver Creek Watershed

Alternative 4 proposes approximately 12 miles of Class III trail within the Lower Beaver Creek Watershed. Approximately, 5.9 miles of the total are proposed on existing National Forest System Roads and approximately 5.8 miles would be new trail construction. Approximately 0.2 miles of new trail and 1.0 miles of trail on existing roads in the Lower Beaver Creek Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. A total of three existing stream crossings are proposed for use, all of which cross intermittent streams.

North Wolf Creek Subwatershed

Within the North Wolf Creek Subwatershed, approximately 3.2 miles of existing National Forest System Road, mostly closed roads, and approximately 1.2 miles of new trail are proposed to be constructed as part of Alternative 4. The 1.2 miles of new trail are predominately along ridges and in areas not adjacent to stream channels.

Flow and Sediment Regimes

Designating Class III trails in the Alternative 4 proposed locations in the North Wolf Creek Subwatershed would have the effect of improving flow and sediment regime conditions in the long-term relative to past cross-country travel and would essentially maintain flow and sediment conditions relative to the no action alternative. By adding approximately 1.2 miles of trail to the overall subwatershed road/trail network, the road/trail densities increase somewhat from 3.0 to 3.3 miles per square mile, however, relative to the overall range in existing road densities across the Ochoco Summit project area, the rating for road/trail densities remains as moderate. Drainage densities are relatively high (2.9 miles per square mile); however, by not adding any new intermittent or perennial stream crossings in the North Wolf Creek Subwatershed, the overall stream crossing density remains the same at 3.3 crossings per square mile with a moderate rating. In addition, all of the trails proposed within this subwatershed as part of Alternative 4 are Class III trails, designed for 24-inch wide motorcycle clearance, which would have much less disturbance and potential for capture of drainage as compared to the wider Class I and Class II trails. Since the majority of the trails proposed in the

North Wolf Subwatershed are located on existing roads and the new trails do not cross intermittent or perennial stream channels, this minor increase in road/trail densities across the subwatershed are not likely to increase the flow and sediment regime relative to the existing condition.

Sediment/Turbidity

Designating Class III trails in the Alternative 4 proposed locations in the North Wolf Creek Subwatershed would have the effect of improving water quality conditions in the long-term (i.e. approximately 2-3 years post-construction) relative to past cross-country travel and would essentially maintain water quality conditions relative to the no action alternative assuming extensive historic cross-country OHV trail systems currently exist.

Approximately 0.2 miles of trail would be added within 300 feet of an intermittent stream, no new stream crossings would be added, and no new trail is proposed that crosses known GDEs within the forest boundary portion of the subwatershed. By adding approximately 0.2 miles of trail to the road/trail network within the sediment delivery zone of streams in the North Wolf Creek Subwatersheds, the road/trail densities increase slightly from 6.3 to 6.4 miles per square mile, however, relative to the overall range in existing road densities across the Ochoco Summit project area, the rating for road/trail densities within 300 feet of streams remains as moderate. Slope Erosion Hazard Ratings are relatively high; however, by not adding any new intermittent or perennial stream crossings and only minimal trail length near streams in the North Wolf Creek Subwatershed, the additional erosion potential from the 0.2 additional miles of trail is not expected to measurably increase sediment delivery to the streams or stream turbidity in the North Wolf Creek Subwatershed.

Upper North Fork Crooked River Watershed

Alternative 4 proposes approximately 47 miles of Class I trail and approximately 30 miles of Class II trail within the Upper North Fork Crooked River Watershed. Approximately 28 miles of Class I trail and 19 miles of Class II trail are proposed on existing National Forest System Roads. Approximately 18 miles of Class I trail and 11 miles of Class II trail would be new trails not already part of the existing National Forest System road network. Approximately 6.5 miles of new trail and 17 miles of trail on existing roads in the Upper North Fork Crooked River Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. A total of 22 new and 37 existing intermittent and perennial stream crossings are proposed for use.

Elliot Creek Subwatershed

Within the Elliot Creek Subwatershed, approximately 9.0 miles of Class I trail are located on existing National Forest System Road and approximately 4.3 miles of Class I new trail are proposed to be constructed as part of Alternative 4. Alternative 4 proposes for Class I trails to cross perennial and intermittent streams at 13 locations at existing stream crossings on existing roads and to cross perennial and intermittent streams with new trails at eight locations.

The Maxwell Fire BAER rehabilitation road treatments, included rehabilitation work on segments of two roads within the Elliot Creek Subwatershed, FS 2200-505 and FS 2200-500. Approximately 0.04 miles of Class I trail overlap FS 2200-500 where water bars were recommended for installation to enable roads to better handle expected surface runoff increases. Approximately 0.24 miles of Class I trail overlap FS 2200-505, which crosses one intermittent and one perennial tributary to Elliot Creek and parallels the stream within the RHCA for almost the entire segment length. The crossing over the perennial tributary to Elliot Creek was undersized and was removed and replaced with rock ford as part of the Maxwell Fire BAER rehabilitation. Based on design criteria, implementation of the Alternative 4 trail system would require installation of a culvert or bridge at this stream crossing location. Based on the BAER report for the Maxwell Fire, the vegetative recovery period was seven years, which would indicate hydrologic recovery should occur by the end of the summer of 2013.

Flow and Sediment Regimes

Constructing new Class I trails and stream crossings at the locations proposed in Alternative 4 in the Elliott Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term (i.e. approximately 2-3 years post-construction) relative to past cross-country travel; however, compared to the no action alternative, it could increase the effects of flow and sediment regime on the subwatershed by increasing road/trail densities and stream crossing densities overall. By adding approximately 4.3 miles of trail to the overall subwatershed road/trail network, the road/trail densities increase somewhat from 3.3 to 3.6 miles per square mile, increasing trail/road density conditions from low to moderate relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively high (2.8 miles per square mile) and by adding eight new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Elliott Creek Subwatershed, the overall stream crossing density increases from 3.4 to 3.9 crossings per square mile, bringing the overall rating up from moderate to high relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are high in the vicinity of streams in the Elliott Creek Subwatershed, which can make interconnectivity of roads and streams more likely potentially resulting in increased peak flows in streams. Increases in the road/trail and stream crossing densities across the Elliott Creek Subwatershed, in combination with poor slope erosion hazard conditions, potentially increases the flow and sediment regime relative to the existing condition.

Sediment/Turbidity

Designating Class I trails and constructing new trails and stream crossings at the locations proposed in Alternative 4 in the Elliott Creek Subwatershed may improve somewhat the bank stability and sediment delivery conditions in the long-term (i.e. approximately 2-3 years post-construction) relative to past cross-country travel; however, compared to the no action alternative, it could increase the sediment delivery to streams and exacerbate bank stability conditions at some site specific locations in the subwatershed. In the short-term (i.e. approximately 2-3 years) with the implementation of Alternative 4 in this subwatershed, sediment delivery would increase; however, in the long-term (i.e. approximately 2-3 years post-construction), once most user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition assuming extensive historic cross-country OHV trail systems currently exist.

Approximately 1.7 miles of trail would be added within 300 feet of an intermittent stream, eight new stream crossings would be added, and 0.3 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 1.7 miles of trail to the road/trail network within the sediment delivery zone of streams in the Elliot Creek Subwatershed, the road/trail densities increase from 4.3 to 4.6 miles per square mile, however, relative to the overall range in existing road densities across the Ochoco Summit project area, the rating for road/trail densities within 300 feet of streams remains as low. The addition of 0.3 miles of trail within GDEs and associated RHCAs raises road densities in GDEs from approximately 2.8 to 3.0 miles per square mile, maintaining a low rating relative to other project subwatersheds. Slope Erosion Hazard Ratings are relatively high, making erosion and potentially sediment delivery more likely in the subwatershed. Sediment delivery estimates from the Aquatic Species section for this project indicate an addition of a relatively high amount of sediment delivery to the no action alternative.

Existing bank stability in Fox Creek, the only stream in the Elliot Creek Subwatershed with a Level II stream survey conducted, is relatively good and met LRMP standards as of 2002. In addition, the dominant channel type of Fox Creek has moderate channel sensitivity and recovery potential. Other reaches of Fox Creek are classified as A4 and C4 channel types. A4 channel types generally have extreme channel sensitivity and very poor recovery potential, while C4 channel types generally have very high channel sensitivity and good recovery potential. No new trails are proposed to cross or

parallel Fox Creek. Assuming that other streams in the Elliot Creek Subwatershed exhibit similar dominant channel type conditions and the implementation of design criteria that require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, bank stability is likely to be maintained, unless increased peak flows result from increases in road/trails and stream networks.

Based on high Slope Erosion Hazard conditions, increases in both road/trail densities within the sediment delivery zone, and increases in stream crossing densities, Alternative 4 proposed new trails have the potential to increase sediment delivery to streams; however, bank stability is likely to be maintained.

Howard Creek Subwatershed

Within the Howard Creek Subwatershed, approximately 5.9 miles of Class I trail are located on existing National Forest System Road and approximately 7.9 miles of new Class I trail are proposed to be constructed as part of Alternative 4. Alternative 4 proposes for Class I trails to cross perennial and intermittent streams at existing stream crossing locations at two locations and with new trails at four locations.

Flow and Sediment Regimes

Designating Class I trails and constructing new trails and stream crossings at the locations proposed in Alternative 4 in the Elliot Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the effects of flow and sediment regime on the subwatershed by increasing road/trail densities and stream crossing densities overall. By adding approximately 7.9 miles of trail to the overall subwatershed road/trail network, the road/trail densities increase from 4.6 to 5.1 miles per square mile, both of which are high relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively moderate (2.2 miles per square mile) and by adding four new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Howard Creek Subwatershed, the overall stream crossing density increases from 4.1 to 4.4 crossings per square mile, both of these densities are high relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Howard Creek Subwatershed. Increases to the already high road/trail and stream crossing densities across the Howard Creek Subwatershed have the potential to increase peak flows and shorten response times relative to the existing condition.

Sediment/Turbidity

Designating Class I trails and constructing new trails and stream crossings at the locations proposed in Alternative 4 in the Howard Creek Subwatershed may improve somewhat the bank stability and sediment delivery conditions in the long-term (i.e. approximately 2-3 years post-construction) relative to past cross-country travel; however, compared to the no action alternative, it could increase the sediment delivery to streams. In the short-term (i.e. approximately 2-3 years) with the implementation of Alternative 4 in this subwatershed, sediment delivery would increase; however, in the long-term, once user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition assuming extensive historic cross-country OHV trail systems currently exist.

Approximately 1.5 miles of trail would be added within 300 feet of an intermittent stream, four new stream crossings would be added, and 1.2 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 1.5 miles of trail to the road/trail network within the sediment delivery zone of streams in the Elliot Creek Subwatershed, the road/trail densities increase from 8.2 to 8.6 miles per square mile, both of these

densities are high relative to the other Ochoco Summit project area Subwatersheds analyzed. The addition of 1.2 miles of trail within GDEs and associated RHCAs raises road densities in GDEs from approximately 6.9 to 7.4 miles per square mile, bringing the overall rating up from moderate to high relative to the other subwatersheds. Sediment delivery estimates from the Aquatic Species section for this project indicate an addition of a relatively low amount of sediment delivery to the no action alternative.

Existing bank stability in surveyed streams in the Howard Creek Subwatershed is relatively good and met LRMP standards between 1994 and 2001. In addition, the dominant channel types of streams in the subwatershed are B4 channel types, which have moderate channel sensitivity and excellent recovery potential. At the location of the new Class I trail stream crossing on Howard Creek, the channel type indicates that the channel should have low streambank erosion potential. No channel type information was gathered for the remaining three new stream crossings in the Howared Creek Subwatershed. Dominant channel types in Howard Creek, South Fork Howard Creek, and West Fork Howard Creek indicate moderate channel sensitivity and excellent recovery potential, whereas, dominant channel type in East Fork Howard Creek indicate very high channel sensitivity and good recovery potential of the stream. Assuming that other streams in the Howard Creek Subwatershed exhibit similar dominant conditions to Howard Creek and the implementation of design criteria that require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, bank stability is likely to be maintained, unless increased peak flows result from increases in road/trails and stream networks.

Based on increases in both road/trail densities within the sediment delivery zone and within and near GDEs, Alternative 4 proposed new trails have the potential to increase sediment delivery to streams; however, banks stability is likely to be maintained.

Peterson Creek Subwatershed

Within the Peterson Creek Subwatershed, approximately 13 miles of Class I trail and 4.8 miles of Class II trail are located on existing National Forest System Road and approximately 5.4 miles of Class I trail and 2.5 miles of Class II new trail are proposed to be constructed as part of Alternative 4. Alternative 4 proposes for Class I trails to cross perennial and intermittent streams with new trails at four locations and to cross perennial and intermittent streams on existing roads at four locations. Class II trails are proposed to cross perennial and intermittent streams at no new locations and to cross perennial and intermittent streams at five locations at existing stream crossings on existing roads.

The Maxwell Fire BAER rehabilitation road treatments, included rehabilitation work on segments of one road within the Peterson Creek Subwatershed, FS 2200-550. Approximately 0.18 miles of Class I trail overlap FS 2200-550, which crosses Allen Creek, a fish-bearing perennial stream. The crossing structure was removed and banks were laid back as part of the Maxwell Fire BAER rehabilitation. Based on design criteria, implementation of the Alternative 4 trail system would require installation of a culvert or bridge at this stream crossing location. The operational maintenance level of this road is Level I (Closed); however, the objective maintenance of this road is decommissioned, likely attributed to the potential for sedimentation into a high quality, fish-bearing perennial stream. Based on the BAER report for the Maxwell Fire, the vegetative recovery period was seven years, which would indicate hydrologic recovery should occur by the end of the summer of 2013. Field trips to the site during the summer of 2011 indicated that Allen Creek, in the vicinity of this stream crossing, was still in an unstable state and was still in the process of recovering from impacts from the Maxwell Fire.

Flow and Sediment Regimes

Designating Class I and II trails and constructing new trails and stream crossings at the locations proposed in Alternative 4 in the Peterson Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the effects of flow and sediment regime on the subwatershed by increasing road/trail densities and reopening roads slated for decommissioning. By adding approximately 7.8 miles of trail to the overall subwatershed road/trail network, the road/trail densities increase from 3.2 to 3.6 miles per square mile, increasing the rating from low to moderate relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively high (2.7 miles per square mile) and by adding four new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Peterson Creek Subwatershed, the overall stream crossing density increases from 2.7 to 2.9 crossings per square mile, both of these densities are moderate relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Peterson Creek Subwatershed. Increases to the already high road/trail across the Peterson Creek Subwatershed have the potential to slightly increase peak flows and shorten response times relative to the no action alternative.

Sediment/Turbidity

Designating Class I and II trails and constructing new trails and stream crossings at the locations proposed in Alternative 4 in the Peterson Creek Subwatershed may improve somewhat the bank stability conditions in the long-term (i.e. approximately 2-3 years post-construction) relative to past cross-country travel; however, compared to the no action alternative, it could increase the sediment delivery to streams at site specific locations.

Approximately 1.5 miles of trail would be added within 300 feet of an intermittent or perennial stream, four new stream crossings would be added, and approximately 0.1 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 1.5 miles of trail to the road/trail network within the sediment delivery zone of streams in the Peterson Creek Subwatershed, the road/trail densities increase from 4.3 to 4.5 miles per square mile, both of these densities are low relative to the other Ochoco Summit project area Subwatersheds analyzed. The addition of approximately 0.1 miles of trail within GDEs and associated RHCAs slightly increases the road densities in GDEs from 5.5 to 5.6 miles per square mile, which are both low relative to the other subwatersheds.

Existing bank stability in surveyed streams in the Peterson Creek Subwatershed is relatively good and met LRMP standards in 2001 in the East Fork of Allen Creek; however, bank stability is predominately relatively fair and not meeting LRMP standards in Allen Creek and Peterson Creek, based on stream surveys in 2002 and 2006-2007, respectively. The 2007 Level II stream survey in Peterson Creek; however, found unstable bank conditions with cutbanks of approximately 36 percent of the length of Reach 6 where a Class I trail overlaps the FS 2630 road and crosses the stream. In addition, the dominant channel types of streams in the subwatershed are C4 channel types, which have very high channel sensitivity and good recovery potential. At the location of the new Class I trail stream crossing on the East Fork of Allen Creek as well as through the stream reaches that were surveyed, the channel type indicates that the channel should have very high streambank erosion potential. Since peakflow increases are expected to be minor and design criteria require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, overall bank stability is likely to be maintained. At site specific locations; however, by converting a closed road, with an objective maintenance of decommissioned, to Class I trail that crosses Allen Creek in an unstable portion of the stream and by adding two miles of Class II trail on a

High Slope Erosion Hazard slope near Peterson Creek, site specific locations may experience higher incidents of unstable banks and sediment delivery.

Based on site specific sediment delivery and bank stability concerns, Alternative 4 proposed trails have the potential to increase sediment delivery to streams and unstable banks at site specific locations, which would delay recovery to LRMP standards of bank stability in Allen Creek and potentially add to sediment and turbidity increases in Peterson Creek.

Porter Creek Subwatershed

Within the Porter Creek Subwatershed, approximately 0.7 miles of Class I trail and 14 miles of Class II trail located on existing National Forest System Road are proposed in Alternative 4. Approximately 0.8 miles of Class I and 8.8 miles of Class II new trail are proposed to be constructed as part of Alternative 4. No Class I trails are proposed to cross intermittent or perennial stream channels in Alternative 4. Class II trails are proposed to cross perennial and intermittent streams at 13 existing stream crossings and at six new locations.

Flow and Sediment Regimes

Designating Class I and Class II trails and constructing new trails and stream crossings at the locations proposed in Alternative 4 in the Porter Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the effects of flow and sediment regime on the subwatershed by increasing road/trail densities and stream crossing densities overall. By adding approximately 9.6 miles of trail to the overall subwatershed road/trail network, the road/trail densities increase from 3.7 to 4.4 miles per square mile, increasing the rating from moderate to high relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively high (2.8 miles per square mile) and by adding six new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Porter Creek Subwatershed, the overall stream crossing density increases from 4.0 to 4.4 crossings per square mile, both of these densities are high relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are low in the vicinity of streams in the Porter Creek Subwatershed. Slight increases to the road/trail density and already high stream crossing density across the Porter Creek Subwatershed in combination with most of the trails being Class III (motorcycle) have the potential to increase impacts to flow and sediment regimes relative to the existing condition.

Sediment/Turbidity

Designating Class I and Class II trails and constructing new trails and stream crossings at the locations proposed in Alternative 4 in the Porter Creek Subwatershed may improve somewhat the bank stability and sediment delivery conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the sediment delivery to streams. In the short-term with the implementation of Alternative 4 in this subwatershed, sediment delivery would increase; however, in the long-term, once most user-created trails have revegetated, sediment delivery to streams have the potential to decrease to levels below the existing condition assuming extensive historic cross-country OHV trail systems currently exist.

Approximately 1.8 miles of trail would be added within 300 feet of an intermittent stream, six new stream crossings would be added, and essentially no miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 1.8 miles of trail to the road/trail network within the sediment delivery zone of streams in the Porter Creek Subwatershed, the road/trail densities increase from 7.4 to 7.8 miles per square mile, both of these densities are high relative to the other Ochoco Summit project area Subwatersheds analyzed. Slope Erosion Hazard conditions for the Porter Creek Subwatershed are low overall, somewhat reducing the risk and magnitude of potential sediment delivery increases for the proposed trail

network in Alternative 4. Sediment delivery estimates from the Aquatic Specie section indicate an addition of a relatively moderate amount of sediment delivery to the no action alternative.

Existing bank stability in surveyed streams in the Porter Creek Subwatershed was relatively good and met LRMP standards in Easter Porter Creek in 1995 and in the top and bottom reaches of Porter Creek in 2006-2007. Bank stability in the middle reach of Porter Creek in 2007 slightly exceeded LRMP standards with approximately 23 percent of the stream length unstable. No trails are proposed to cross Porter Creek on the reach of stream that is not meeting LRMP standards of no more than 20 percent unstable banks. Dominant channel types in Porter Creek indicate moderate channel sensitivity and excellent recovery potential. Assuming that other streams in the Porter Creek Subwatershed exhibit similar dominant conditions to Porter Creek and implementation of design criteria that require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, bank stability is likely to be maintained.

Based on increases in the stream crossing density and the road/trail densities within the sediment delivery zone, Alternative 4 proposed new trails have the potential to increase sediment delivery to streams as described in the Aquatic Species section; however, bank stability is likely to be maintained.

Deep Creek Watershed

Alternative 4 proposes approximately 44 miles of Class I trail and 29 miles of Class III trail within the Deep Creek Watershed. Approximately 29 miles of Class I trail and 23 miles of Class III trail are proposed on existing National Forest System Roads. Approximately 15 miles of Class I trail and 15 miles of Class III trail would be new trails and not already part of the existing National Forest System road network. Approximately 3.2 miles of new trail and 20 miles of trail on existing roads in the Deep Creek Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. A total of 14 new and 29 existing intermittent and perennial stream crossings are proposed for use.

Jackson Creek Subwatershed

Within the Jackson Creek Subwatershed, approximately 13 miles of Class I trail and 20 miles of Class III trail are located on existing National Forest System Road. Approximately 7.0 miles of new Class trail and 7.4 miles of new Class III trail are proposed to be constructed as part of Alternative 4. Class I trails are proposed to cross intermittent or perennial streams at four existing locations and six new locations in Alternative 4. Class III trails are proposed to cross perennial and intermittent streams at at 14 existing stream crossings and at two new locations.

Flow and Sediment Regimes

Designating Class I and Class III trails and constructing new trails and stream crossings at the locations proposed in Alternative 4 in the Jackson Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the effects of flow and sediment regime on the subwatershed by increasing overall road/trail and stream crossing densities. By adding approximately 14.5 miles of new trail to the overall subwatershed road/trail network, the road/trail densities increase from 3.7 to 4.1 miles per square mile, raising the rating from moderate to high relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively low (1.8 miles per square mile) and by adding eight new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Jackson Creek Subwatershed, the overall stream crossing density increases from 1.8 to 2.0 crossings per square mile, both of these densities are low relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Jackson Creek Subwatershed. Increases to the road/trail densities in combination with

slight increases to the stream crossing density have the potential to increase effects to the flow and sediment regime as a result of Alternative 4; however, with low drainage density, these increases may be relatively minor.

Sediment/Turbidity

Designating Class I and Class III trails and constructing new trails and stream crossings at the locations proposed in Alternative 4 in the Jackson Creek Subwatershed may improve somewhat the bank stability conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the sediment delivery to streams. In the short-term with the implementation of Alternative 4 in this subwatershed, sediment delivery would increase; however, in the long-term, once user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition assuming extensive historic cross-country OHV trail systems currently exist.

Approximately 1.5 miles of trail would be added within 300 feet of an intermittent or perennial stream, eight new stream crossings would be added, and 0.5 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 1.5 miles of trail to the road/trail network within the sediment delivery zone of streams in the Jackson Creek Subwatershed, the road/trail densities increase from 6.1 to 6.3 miles per square mile, both of these densities are moderate relative to the other Ochoco Summit project area Subwatersheds analyzed. The addition of 0.5 miles of trail within GDEs and associated RHCAs increases the road densities in GDEs from 5.6 to 5.7 miles per square mile, which are low relative to the other subwatersheds. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Jackson Creek Subwatershed. Estimates of sediment delivery in the Aquatic Species section indicate that Alternative 4 has the potential to add a high amount of sediment delivery relative to the no action alternative (Alternative 1), similar to Alternative 2, but more than Alternative 3.

Existing bank stability in surveyed streams in the Jackson Creek Subwatershed is relatively good and met LRMP standards in Happy Camp Creek and Jackson Creek from 1998 and 2010. Based on Level II stream surveys, the dominant channel types of streams in Happy Camp Creek are E4 channel types and in Jackson Creek are C4 channel types, which have very high channel sensitivity and good recovery potential. At the location of the new Class I stream crossing location on Jackson Creek, the channel type indicates moderate streambank erosion potential; however, slope erosion hazard conditions are high. Since peakflow increases are expected to be negligible, design criteria require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, and based on channel type conditions, overall bank stability is likely to be maintained.

Based on slight increases in both stream crossing and road/trail densities within the sediment delivery zone and in GDEs, as well as overall moderate Slope Erosion Hazard Conditions, and localized high Slope Erosion Hazard Conditions, Alternative 4 proposed new trails have the potential to have a moderate to high sediment delivery increase to streams and GDEs; however, banks stability is likely to be maintained.

Little Summit Prairie Creek Subwatershed

Within the Little Summit Prairie Creek Subwatershed, approximately 5.1 miles of Class I trail and 3.6 miles of Class III trail are located on existing National Forest System Road. Approximately 3.2 miles of Class I trail and 5.6 miles of Class III new trail are proposed to be constructed as part of Alternative 4. Class I trails are proposed to cross perennial and intermittent streams at one existing stream crossing location and two new locations. Class III trails are proposed to cross perennial and intermittent streams at two existing stream crossing locations.

Flow and Sediment Regimes

Designating Class I and Class III trails and constructing new trails and stream crossings at the locations proposed in Alternative 4 in the Little Summit Prairie Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the effects of flow and sediment regime on the subwatershed by increasing overall road/trail and stream crossing densities. By adding approximately 8.8 miles of new trail to the overall subwatershed road/trail network, the road/trail densities increase from 3.8 to 4.2 miles per square mile, bringing the rating from moderate to high relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively low (2.2 miles per square mile) and by adding two new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Little Summit Prairie Creek Subwatershed, the overall stream crossing density increases from 2.5 to 2.6 crossings per square mile, both of these densities are moderate relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Little Summit Prairie Creek Subwatershed. Based on relatively low drainage densities, increases to the road/trail density and stream crossings density across the Little Summit Prairie Creek Subwatershed are likely to have little effect on peak flows, with the potential for an immeasurable increase relative to the no action alternative.

Sediment/Turbidity

Designating Class I and Class III trails and constructing new trails and stream crossings at the locations proposed in Alternative 4 in the Little Summit Prairie Creek Subwatershed may improve somewhat the bank stability conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the sediment delivery to streams. In the short-term with the implementation of Alternative 4 in this subwatershed, sediment delivery would increase; however, in the long-term, once most user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition.

Approximately 0.7 miles of trail would be added within 300 feet of an intermittent or perennial stream, two new stream crossings would be added, and 0.4 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 0.7 miles of trail to the road/trail network within the sediment delivery zone of streams in the Little Summit Prairie Creek Subwatershed, the road/trail densities increase from 7.4 to 7.5 miles per square mile, both of these densities are high relative to the other Ochoco Summit project area Subwatersheds analyzed. The addition of 0.4 miles of trail within GDEs and associated RHCAs increases the road densities in GDEs from 5.1 to 5.4 miles per square mile, which are low relative to the other subwatersheds. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Little Summit Prairie Creek Subwatershed. Estimates of sediment delivery in the Aquatic Species section indicate that Alternative 4 has the potential to add a low amount of sediment delivery relative to the no action alternative (Alternative 1), relatively the same as Alternatives 2 and 4.

Existing bank stability in surveyed streams in the Little Summit Prairie Creek Subwatershed is relatively good and met LRMP standards in surveyed reaches of Little Summit Creek and an unnamed tributary in 1998 and 2010. Based on Level II stream surveys, the dominant channel types of streams in the Little Summit Prairie Creek Subwatershed are C4 channel types, which have very high channel sensitivity and good recovery potential. At the location of the new Class I trail stream crossings on Little Summit Creek, the channel type is a B3 channel type, which indicates that the channel should have low streambank erosion potential. Since peakflow increases are expected to be minor, streambank erosion based on channel type at the stream crossing is low, and design criteria

require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, overall bank stability is likely to be maintained.

Based on slight increases in both road/trail densities within the sediment delivery zone and in GDEs, as well as overall moderate Slope Erosion Hazard Conditions, Alternative 4 proposed new trails have the potential to slightly increase sediment delivery to streams and GDEs; however, bank stability is expected to be maintained.

Lower Deep Creek Subwatershed

Within the Lower Deep Creek Subwatershed, approximately 11 miles of Class I trail are located on existing National Forest System Road. Approximately 5.2 miles of new Class I trail and 2.4 miles of new Class III trail are proposed to be constructed as part of Alternative 4. Alternative 4 proposes for Class I trails to cross perennial and intermittent streams with new trails at four locations and to cross perennial and intermittent streams on existing roads at seven locations. Class III trails are proposed to cross perennial and intermittent streams at one new location.

Proposed restoration projects were identified in the Deep Creek Restoration Plan, some of which have already been implemented. Of the 2.8 miles of road within the sediment delivery zone of streams that were decommissioned in the Lower Deep Creek Subwatershed as part of the Deep Creek Restoration Plan, 0.7 miles of the FS 4200-600 and 0.4 miles of the FS 4200-603 decommissioned roads are planned to be reopened as Class I trails in Alternative 4. The FS 4200-600 road parallels Big Spring Creek, a fish-bearing perennial stream, for approximately 0.3 miles and parallels and intermittent tributary to Big Spring Creek for approximately 0.4 miles. The FS 4200-603 road parallels Buck Hollow, a perennial stream, for approximately 0.4 miles. The reopened portion of the FS 4200-603 road is located on high slope erosion hazard. Approximately a third of the reopened portion of the FS 4200-600 road is located on high slope erosion hazard, a third is located on moderate slope erosion hazard, and a third is located on low slope erosion hazard. Stream crossings would be installed with both of these road segments. Based on design criteria, implementation of the Alternative 4 trail system would require installation of a culvert or bridge at these stream crossing locations.

Flow and Sediment Regimes

Designating Class I and III trails and constructing new trails and stream crossings at the locations proposed in Alternative 4 in the Lower Deep Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the effects of flow and sediment regime on the subwatershed by increasing road/trail densities and reopening decommissioned roads. By adding approximately 7.5 miles of trail to the overall subwatershed road/trail network, the road/trail densities increase from 3.0 to 3.4 miles per square mile, both densities are low relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively low (2.0 miles per square mile) and by adding four new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Lower Deep Creek Subwatershed, the overall stream crossing density increases from 1.8 to 2.0 crossings per square mile, both of these densities are low relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Lower Deep Creek Subwatershed. Based on relatively low drainage densities, slight increases to the road/trail density and stream crossings density across the Lower Deep Creek Subwatershed are likely to have little effect on peak flows, with the potential for an immeasurable increase relative to the no action alternative.

Sediment/Turbidity

Designating Class I and Class III trails and constructing new trails and stream crossings at the locations proposed in Alternative 4 in the Lower Deep Creek Subwatershed may improve somewhat

the bank stability conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the sediment delivery to streams at site specific locations.

Approximately 1.1 miles of trail would be added within 300 feet of an intermittent or perennial stream, four new stream crossings would be added, and 0.5 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. In addition, approximately 1.1 miles of decommissioned roads within 300 feet of streams are proposed to be reopened as Class I trails as part of Alternative 4. By adding approximately 1.1 miles of trail to the road/trail network within the sediment delivery zone of streams in the Lower Deep Creek Subwatershed, the road/trail densities increase from 5.5 to 5.7 miles per square mile, both of these densities are low relative to the other Ochoco Summit project area Subwatersheds analyzed. The addition of virtually 0.5 new miles of trail within GDEs and associated RHCAs increases road densities in GDEs from 7.6 to 8.1 miles per square mile, both of which are high relative to the other subwatersheds. Estimates of sediment delivery in the Aquatic Species section indicate that Alternative 4 has the potential to add a relatively low amount of sediment delivery relative to the no action alternative (Alternative 1), roughly the same as Alternatives 2 and 3.

In addition, approximately 2.4 miles of road with an objective maintenance of closed, would be used as Class I trail (FS 3000-365 and FS 3000-750). These segments parallel the West Fork of Crazy Creek and are located within the sediment delivery zone for their entire length. Slope Erosion Hazard conditions along the entire length are moderate.

Existing bank stability in surveyed streams in the Lower Deep Creek Subwatershed is relatively good and met LRMP standards in the Crazy Creek in 2010 and in Deep Creek in 1999. The dominant channel types of streams in Crazy Creek are B4 channel types, which have moderate channel sensitivity and excellent recovery potential. The dominant channel types of streams in Deep Creek are C4 channel types, which have very high channel sensitivity and good recovery potential. At the location of the new Class I trail stream crossing on Deep Creek, the channel type indicates that the channel should have very high streambank erosion potential. Since peakflow increases are expected to be minor and design criteria require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, overall bank stability is likely to be maintained. At site specific locations, bank stability and increased sediment delivery may be of concern by reopening decommissioned roads that cross and parallel Big Springs Creek and Buck Hollow, a portion of which are on a High Slope Erosion Hazard slope.

Based on site specific sediment delivery and bank stability concerns, Alternative 4 proposed trails have the potential to increase sediment delivery to streams overall and unstable banks at site specific locations, which would potentially add to sediment and turbidity increases in Deep Creek.

Upper Ochoco Creek Watershed

Alternative 4 proposes approximately 37 miles of Class I trail within the Upper Ochoco Creek Watershed. Approximately 21 miles of Class I trail are proposed on existing National Forest System Roads. Approximately 16 miles of Class I trail would be new trails and not already part of the existing National Forest System road network. Approximately 1.3 miles of new trail and 4.4 miles of trail on existing roads in the Upper Ochoco Creek Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. A total of 17 existing intermittent and perennial stream crossings and seven new stream crossings are proposed for use.

Upper Marks Creek Subwatershed

Within the Upper Marks Creek Subwatershed, approximately 20 miles of Class I trail are located on existing National Forest System Road. Approximately 14 miles of new Class I trail are proposed to be

constructed as part of Alternative 4. Alternative 4 proposes for Class I trails to cross perennial and intermittent streams on existing roads at 17 locations and at new stream crossings at seven locations.

Flow and Sediment Regimes

Designating Class I trails and constructing new trails and stream crossings at the locations proposed in Alternative 4 in the Upper Marks Creek Subwatershed may improve somewhat the flow and sediment regime conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could slightly increase the effects of flow and sediment regime on the subwatershed by increasing overall road/trail densities. By adding approximately 14 miles of new trail to the overall subwatershed road/trail network, the road/trail densities increase from 4.1 to 4.9 miles per square mile, both of which are high relative to the overall range in existing road densities across the Ochoco Summit project area. Drainage densities are relatively moderate (2.4 miles per square mile) and by adding seven new intermittent or perennial stream crossings to the existing number of stream crossings by roads in the Upper Marks Creek Subwatershed, the overall stream crossing density increases from 5.0 to 5.4 crossings per square mile, both of these densities are high relative to the other Ochoco Summit project area Subwatersheds analyzed. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Upper Marks Creek Subwatershed. Moderate drainage densities, the addition of seven new stream crossings, and increases to the road/trail and stream crossing densities across the Upper Marks Creek Subwatershed have the potential to increase peak flows and shorten response times relative to the existing condition.

Sediment/Turbidity

Designating Class III trails and constructing new trails and stream crossings at the locations proposed in Alternative 4 in the Upper Marks Creek Subwatershed may improve somewhat the bank stability conditions in the long-term relative to past cross-country travel; however, compared to the no action alternative, it could increase the sediment delivery to streams. In the short-term with the implementation of Alternative 4 in this subwatershed, sediment delivery would increase; however, in the long-term, once user-created trails have revegetated, sediment delivery to streams should decrease to levels below the existing condition, assuming an extensive cross-country OHV trail network currently exists.

Approximately 1.3 miles of trail would be added within 300 feet of an intermittent or perennial stream, seven new stream crossings would be added, and 1.5 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 1.3 miles of trail to the road/trail network within the sediment delivery zone of streams in the Upper Marks Creek Subwatershed, the road/trail densities are increased from 6.2 to 6.5 miles per square mile, which are moderate relative to the other Ochoco Summit project area Subwatersheds analyzed. The addition of 1.5 miles of trail within GDEs and associated RHCAs increases the road densities slightly in GDEs from 6.6 to 7.3 miles per square mile, increasing from moderate to high relative to the other subwatersheds. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Upper Marks Creek Subwatershed. Estimates of sediment delivery in the Aquatic Species section indicate that Alternative 4 has the potential to add a relatively high amount of sediment delivery relative to all other alternatives. Based on increases in stream crossing densities and road densities in GDEs and near streams, as well as sediment delivery estimates, sediment delivery effects are expected to be moderate to high in Alternative 4 for the Upper Marks Creek Subwatershed.

Existing bank stability in surveyed stream reaches in the Upper Marks Creek Subwatershed within the project boundary is relatively good and met LRMP standards in surveyed reaches of Crystal Creek in 2003 and in the only stream reach of Marks Creek within the project boundary with bank stability data from 2010. Based on Level II stream surveys, the dominant channel type of streams in the Crystal Creek is an E4 channel type and in Marks Creek in the 2010 surveyed reach is a C4 channel type, both of which have very high channel sensitivity and good recovery potential. The channel type

at the proposed new stream crossing on Crystal Creek is an E4, which has high streambank erosion potential. A potential exists that bank stability could decrease relative to the existing condition based on potential increases to peakflow, high streambank erosion potential conditions, and increased stream crossing densities. Design criteria require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches; however, bank stability is likely to be maintained, unless increased peak flows result from the increases in road/trails and stream networks.

Based on increased road/trail densities, stream crossing densities, road/trail densities in the vicinity of streams and GDEs, and channel type conditions in the Upper Marks Creek Subwatershed; Alternative 4 proposed trails have the potential to increase sediment delivery to streams and unstable banks, which would potentially add to sediment and turbidity increases in Marks Creek.

Alternative 4 Summary

Alternative 4 was developed in response to an issue identified during scoping that the proposed action trail system is too small and lacks quality. Alternative 4 includes trails for class I, II and III vehicles over more area and with more miles than the Proposed Action. Alternative 4 proposes a total of 95 miles of Class I vehicle (ATV) trails or roads, 19 miles of Class II vehicle (4x4), and 45 miles of Class III vehicle (motorcycle) trail/roads. In the short-term (i.e. approximately 2-3 years) with the implementation of Alternative 4, sediment delivery would increase; however, in the long-term (i.e. approximately 2-3 years post-construction), even though some user-created trails have revegetated, due to the extensive network of OHV trails added in this alternative, impacts to the flow and sediment regime and sediment/turbidity levels in the streams would likely remain at or in excess of the existing condition. Alternative 4 would result in the largest impact to streams and watersheds within the Ochoco Summit project area as compared to all of the other three alternatives.

Cumulative Effects

Future and Ongoing Projects

Hash Rock Wildfire (2000): The Hash Rock Wildfire started on August 23, 2000 and encompassed about 18,275 acres. The fire burned primarily within two 5th order Hydrologic Units, Upper Ochoco Creek Watershed (HUC 1707030502) and Mill Creek Watershed (HUC 1707030503). Within the Upper Ochoco Creek Watershed, the fire effects were confined primarily to the Upper Marks Creek Subwatershed. Within the Upper Marks Creek Subwatershed, the fire covered much of the McGinnis Creek, Reilly Creek, Cornez Creek, Hamilton Creek drainages, as well as the headwaters of the Buck Creek drainage. Within the Upper Marks Creek Subwatershed, the highest burn intensities occurred in Hamilton relative to the McGinnis, Reilly, and Cornez Creek areas. The effects of the fire may last up to 40 years or more in these areas until forest vegetation becomes reestablished. Effective ground cover (grass, shrubs) reestablished within 2-5 years with favorable growth conditions.

Deep Creek Watershed Restoration (2004): The purpose of the Deep Creek Restoration Plan was to improve overall stream and riparian health and integrity within the watershed and improve water quality and associated habitat suitable for use by redband trout and other aquatic life. The needs for the proposed action are derived from the differences between current conditions and desired conditions, as described in Forest Plan direction and management objectives. The decision was made to: 1) Replace 35 culverts and 3 culverts with rock fords to allow passage of flood flows and improve upstream access for redband trout; 2) create 7 water developments, 227 acres of grazing exclosures, 342 acres of riparian pasture, and place large wood along 3.6 miles of stream to better distribute livestock, 3) repair 37 headcut complexes and 18 exposed cutbanks, close, decommission, and reconstruct 47 miles of roads, reconstruct 0.25 miles of channel reaches to reduce instream sedimentation, and construct 6 in-stream structures to promote pool habitat for fisheries. Most proposed activities are located within RHCA's and were designed to move the watershed towards meeting interim Riparian Management Objectives (RMOs).

Maxwell Fire (2006): In 2006, a wildfire called the Maxwell Fire affected approximately 2,317 acres in Allen Creek, East Fork Allen Creek, and Elliot Creek drainages. Potential sedimentation in stream reaches within and below moderate to high severity burn areas were identified as values at risk within Allen Creek, East Fork Allen Creek, and Elliot Creek (BAER 2006). Erosion during snow melt runoff during the spring of 2007 added to the loss of filtering vegetation from the wildfire in RHCAs along Allen Creek, East Fork Allen Creek, and Elliot Creek. Roads were closed and culverts were pulled to reduce erosion and sediment delivery to streams. Specifically, culverts were removed and outlsoped drain dips were installed on FR2200-500, FR2200-550, and FR2200-505 (BAER 2006).

Canyon Fuels and Vegetation Management (2010): The Canyon project area is approximately 31,500 acres and falls within the Upper Ochoco Creek Watershed. As described in the Record of Decision, there are 13,632 planned for treatment, 4099 acres of which would be treated through commercial harvest, 5862 acres to be treated through pre-commercial harvest, 1395 acres of juniper removal, 236 acres of hardwood treatments, and 2038 acres of underburning. Road management estimates include approximately 0.6 miles of new specific road construction, 2.0 miles of temporary road construction, 4.4 miles of reuse of temporary roads, 4.9 miles of decommissioning of existing roads, and 2.9 miles of closure of existing roads.

Howard Elliot Johnson Fuels and Vegetation Management (2011): The Howard Elliot Johnson project area is approximately 44,858 acres and falls within three subwatersheds within the Upper North Fork Crooked River Watershed; the Howard Creek, Elliot Creek, and Johnson Creek Subwatersheds. As described in the Record of Decision, there are 4,370 acres of which would be treated through commercial harvest (including fuel treatments), 3,007 acres to be treated through pre-commercial harvest (including fuel treatments), 608 acres of juniper removal, 611 acres of hardwood treatments, 6,247 acres of prescribed burning only, and 1,573 acres of conditional prescribed fire. Road management estimates include approximately 0.4 miles of new specific road construction, 5.1 miles of temporary road construction, 11.7 miles of use of temporary roads on existing disturbance, 1.7 miles of road reconstruction, 2.3 miles of decommissioning of existing roads, and 2.9 miles of closure of existing roads.

Jackson Fuels and Vegetation Management (2012): The Jackson project area is approximately 54,609 acres and falls within three subwatersheds within the Upper North Fork Crooked River Watershed; Howard Creek, Elliot Creek, and Johnson Creek Subwatersheds. About 5,744 acres will be treated through commercial harvest, 14,703 acres will be treated through pre-commercial harvest, 893 acres will receive juniper cutting and associated fuel treatments, 295 acres will receive hardwood treatments, and 1,934 acres will be underburned without other associated treatments. Road management estimates include approximately 0.4 miles of new specific road construction, 10 miles of temporary road construction, 15 miles of use of temporary roads on existing disturbance, 0.3 miles of road reconstruction, and between 11 and 43 skid trail stream crossings.

Spears Vegetation Management (2007): The Spears project area is approximately 39,200 acres and falls within the Upper Ochoco Creek Watershed. As described in the Record of Decision, there are 4,935 acres that would be treated through commercial harvest, 10,935 acres to be treated through pre-commercial harvest, and 196 acres of hardwood treatments. Fuel reduction activities include approximately 15,162 acres of prescribed fire, 2,490 acres of grapple piling, and 793 acres of hand piling. Road management estimates include approximately 4.4 miles of new road construction, and 11 miles of road reconstruction.

Travel Management Project (2011): The Record of Decision for the Travel Management Project was signed in September 2011 and the Travel Management Decision implementation started as of January 2012. The decision does the following: 1) limits motor vehicle use to designated roads, trails, and areas shown on the Motor Vehicle Use Maps; 2)designates some gravel pits open to motorized access; 3) creates new conditions for motor vehicle access off of designated roads for dispersed

camping; 4) changes some system roads to highway legal vehicle use only. No existing open designated roads or motorized trails were closed as a result of the decision; however, changes to cross-country travel, motorized access for dispersed camping, and motorized mixed use (highway legal and non-highway legal vehicles) of some system roads were made. Cross-country travel is no longer allowed on the Ochoco National Forest. Motorized access for dispersed camping is only allowed to existing sites within 300 feet of roads shown on the Motor Vehicle Use Map and motor vehicles cannot drive closer than 30 feet to any wetland, stream, or water body at dispersed campsites. The decision makes no changes to developed campgrounds and does not apply to over-snow motorized travel or permitted activities such as firewood cutting.

Marks Creek Allotment Management Plan (2011): The Marks Creek Allotment Management Plan reauthorizes grazing in the Marks Creek, Ortman, and Wildcat Allotments; authorizes a variety of rangeland improvements; and implements riparian restoration activities. Almost the entire Marks Creek AMP project area is encompassed within the Upper Ochoco Creek Watershed; however, small portions of the project area also intersect the Bridge Creek and Lower Ochoco Creek Watersheds. Five subwatersheds are intersected by the project area: Lower Marks Creek, Upper Marks Creek, Duncan Creek-Ochoco Creek, Ochoco Reservoir-Ochoco Creek, and Middle Bear Creek.

Alternative 1

Flow and Sediment Regime

The no action alternative proposes adding no new trail system on the Ochoco National Forest and since the Travel Management Rule no longer allows cross-country OHV travel, there should be no cumulative effects occurring with the implementation of Alternative 1. The existing condition of the watersheds would be maintained with the addition of the future and ongoing vegetation management project effects, which were analyzed in their associated EIS documents.

Existing trails across the landscape from past OHV cross-country travel use would no longer be used and some trails would revegetate over time. Some trails, likely those trails that have connectivity with the drainage network, would continue affecting the flow and sediment regimes until active rehabilitation is implemented.

Sediment/Turbidity

The no action alternative proposes adding no new trail system on the Ochoco National Forest and since the Travel Management Rule no longer allows cross-country OHV travel, there should be no cumulative effects occurring with the implementation of Alternative 1. The existing condition of the watersheds would be maintained with the addition of the future and ongoing vegetation management project effects, which were analyzed in their associated EIS documents. Effects to streams from wildfire would continue to recover.

Existing trails across the landscape from past OHV cross-country travel use would no longer be used and some trails would revegetate over time. Some trails, likely those trails that have connectivity with the drainage network, would continue delivering sediment to stream channels until active rehabilitation is implemented.

Following the Hash Rock and Maxwell Wildfires, there was likely an increased sediment load in streams due to increased surface and bank erosion. As vegetation reestablished, surface erosion has decreased and regrowth of riparian vegetation stabilized banks at some locations. Sediment supply in affected streams would continue to adjust until sediment loads stabilize to pre-wildfire levels, once vegetation has completely reestablished.

Action Alternatives

Flow and Sediment Regime

The effects of past and present actions are described in detail under the "Direct and Indirect Effects" section. Future and ongoing portions of the preceding list of projects that overlap the Ochoco Summit project area have the potential to result in cumulative effects to streams relative to the flow and sediment regime. According to the LRMP, harvest activities on the Ochoco National Forest should not increase the Equivalent Harvest Acres (EHA) above the thresholds listed for forest watersheds by sensitivity class (Table 75). Changes to the timing and increases in peak flows resulting from increased connectivity of streams and proposed trails in addition to potential timing and increases in peak flows from harvest activity and associated road construction may have the potential to increase peak flows above the threshold described in the LRMP.

Future and ongoing projects that have the potential to cumulatively impact the flow and sediment regimes in the Ochoco Summit project area include the Howard Elliot Johnson Vegetation Management Project, the Canyon Vegetation Management Project, the Spears Vegetation Management Project, the Jackson Vegetation Management Project, and the Deep Creek Restoration Project. These projects overlap portions of the Upper North Fork Crooked River, Deep Creek, and Upper Ochoco Creek Watersheds. The Howard Elliot Johnson Vegetation Management Hydrology Report estimated a peak EHA of 7.5 percent in 2013 for the selected alternative, Alternative 2 (Table 75). The Canyon Vegetation Management Hydrology Report estimated a peak EHA of 13.38 percent in 2012 for the Alternative 3, a modification of which was selected in the Record of Decision (Table 75). The peak EHA for the Deep Watershed was reported as 15.34 percent in 2014 for the proposed action as described in the Draft Hydrology Report for the Deep Project (Table 75). Peak EHA values from vegetation management analyses are all below the LRMP EHA Thresholds by approximately 10 to 22 percent.

Table 75. Alternative 2 flow and sediment regime cumulative effects summary by watershed.

Watershed	Peak Vegetation Management Project EHA (%)	EHA Threshold (%)
Upper North Fork Crooked River	13.4	30
Deep Creek	15.3	25
Upper Ochoco Creek	7.5	30

Table 76 and Table 77 show the changes to road/trail densities and stream crossing densities with the implementation of all of the anticipated future and ongoing projects listed in this section. Road miles and stream crossings include all of the estimated temporary road miles that are planned for the future, even though these miles of road may not exist on the ground all at the same time. In addition, the miles of road planned for decommissioning by watershed were subtracted from the total miles of road, though the timing of the implementation may or may not overlap in time with other planned road construction.

Overall new temporary and specified roads planned as part of vegetation management projects range for the Upper North Fork Crooked River Watershed, Deep Creek Watershed, and the Upper Ochoco Watershed are 5.1 miles, 10.5 miles, and 1.0 mile, respectively. These new roads in addition to proposed trail miles minus planned decommissioned roads result in slightly reduced road densities in the Deep Creek and Upper Ochoco Creek Watersheds since more miles of road are planned to be decommissioned than are planned for construction. A net increase of 2.8 miles of road would be constructed as part of planned projects other than the Ochoco Summit Project in the Upper North Fork Crooked River Watershed, essentially maintaining the road density for the no action alternative, increasing it by a negligible amount from 2.69 to 2.71 miles per square mile.

Vegetation management projects that are planned in the Ochoco Summit project area Watersheds include construction of new temporary and specified road stream crossings over perennial or intermittent streams. Approximately eight new stream crossings are anticipated in the Upper North Fork Crooked River Watershed and approximately six are planned in the Deep Creek Watershed (Table 77). Slight increases result as a cumulative effect of adding stream crossings as part of vegetation management project to existing road stream crossings in the Upper North Fork Crooked River and Deep Creek Watersheds, increasing the stream crossing density for the no action alternative from 2.46 to 2.52 and from 2.05 to 2.12 crossings per square mile, respectively.

Table 76. Cumulative road/trail densities with implementation of future and ongoing projects.

Watershed	Existing Condition Road Density (Miles/Miles^2)	Veg Project New Temp and Spec Roads (Miles)	Future Decom Roads (Miles)	Cumulative Road/Trail Density (Miles/Miles^2)			
				Alt 1	Alt 2	Alt 3	Alt 4
Upper North Fork Crooked River	2.69	5.1	2.3	3.48	3.77	3.70	3.84
Deep Creek	3.56	10.5	17.6	2.71	2.93	2.81	2.93
Upper Ochoco Creek	2.55	1.0	2.4	2.89	2.93	2.93	2.93

Table 77. Cumulative stream crossing density with implementation of future and ongoing projects.

Watershed	Existing Stream Crossing Density (Miles/Miles^2)	Veg Project New Temp and Spec Stream Crossings	Max Cumulative Stream Crosing Density			
			Alt 1	Alt 2	Alt 3	Alt 4
Upper North Fork Crooked River	2.46	8	2.52	2.99	2.63	2.95
Deep Creek	2.05	6	2.12	2.53	2.39	2.61
Upper Ochoco Creek	3.24	0	3.24	3.27	3.34	3.44

Livestock grazing occurs across the Ochoco Summit project area within the Ochoco National Forest. Recently, improvements to grazing management were made, as described in the Marks Creek Allotment Management Plan. Implementation of this plan should improve grazing impacts to streams; however, cattle would likely use some of the user-created trails across the Ochoco National Forest. Cattle use of these user-created trails would reduce the number and miles of trail that would revegetate over time without active decommissioning; potentially maintaining existing connectivity of streams and user-created trails.

Based on estimated EHA values from vegetation management projects and almost negligible increases in the overall road/trail and stream crossing densities in the watersheds with future and ongoing projects, cumulative effects from future and ongoing projects to the sediment and flow regimes are anticipated to be negligible. In addition, due to the large departure between EHA values and LRMP thresholds, it is unlikely that the implementation of the Ochoco Summit trail systems would increase EHA values above LRMP thresholds. Essentially, there are no measurable increased cumulative effects beyond those effects described in the “Direct and Indirect Effects” section relative to the flow and sediment regimes within the watersheds that overlap the Ochoco Summit project area.

Sediment/Turbidity

The effects of past and present actions are described in detail under the “Direct and Indirect Effects” section. Future and ongoing portions of the preceding list of projects that overlap the Ochoco Summit project area have the potential to result in cumulative effects to streams relative to sediment delivery to and turbidity increases in streams and GDEs. Cumulative increases in miles of road and trail nears

streams and GDEs have the potential to further increase impacts to stream and GDE habitat quality. In order to assess whether there is a cumulative impact to streams from vegetation management road construction and to account for the mitigating effect of planned road decommissioning, miles of planned road construction and road decommissioning within the sediment delivery zone of perennial and intermittent streams and within GDEs and their associated RHCAs were estimated and an overall density was calculated (Table 78 and Table 79). Since increased peak flows are not anticipated to be cumulatively increased by planned future and ongoing projects, cumulative increases in bank erosion are also not anticipated.

Table 78. Cumulative road/trail densities within 300 feet of streams with the implementation of future and ongoing projects.

Watershed	Existing Condition Road Density in Sediment Delivery Zone (Miles/Miles^2)	Veg Project New Temp and Spec Roads in Sediment Delivery Zone (Miles)	Future Decom Roads in Sediment Delivery Zone (Miles)	Cumulative Road/Trail Density in Sediment Delivery Zone (Miles/Miles^2)			
				Alt 1	Alt 2	Alt 3	Alt 4
Upper North Fork Crooked River	3.44	0.81	0.43	3.45	3.65	3.53	3.64
Deep Creek	6.25	1.1	13.4	5.61	5.80	5.75	5.78
Upper Ochoco Creek	1.08	0.06	2.1	1.00	1.01	1.04	1.05

Table 78 and Table 79 display the miles of new road, decommissioned roads and cumulative road/trail densities within 300 feet of streams and within wetland and spring RHCAs, respectively. Total road/trail densities in the Upper Ochoco Creek Watershed are particularly low based on the road layer used, which did not include miles of road outside the forest boundary as well as due to portions of the Mill Creek Wilderness roadless area overlapping this watershed. Upper North Fork Crooked River Watershed road/trail densities are also affected by the watershed encompassing the Big Summit Prairie, which is on private land and has very few roads.

Table 79. Cumulative road/trail densities within GDE RHCAs with the implementation of future and ongoing projects.

Watershed	Existing Condition Road Density in GDE RHCA (Miles/Miles^2)	Veg Project New Temp and Spec Roads in GDE RHCA (Miles)	Future Decom Roads in GDE RHCA (Miles)	Cumulative Road/Trail Density in GDE RHCA (Miles/Miles^2)			
				Alt 1	Alt 2	Alt 3	Alt 4
Upper North Fork Crooked River	1.42	1.8	0.08	1.48	1.53	1.52	1.54
Deep Creek	4.98	0.52	2.14	4.70	4.98	4.93	4.95
Upper Ochoco Creek	7.20	1.3	1.0	7.25	7.31	7.46	7.48

Three roads in the Deep Creek Watershed planned for decommissioning by the Deep Creek Restoration Plan are planned for use as trails for Alternatives 2 and 4 and two of these roads are planned for use as trails in Alternative 3 (Table 80). Alternative 3 would not convert FS 1200-504 to trail. Approximately 1.41 miles of these roads are within the sediment delivery zone along intermittent or perennial streams and approximately 0.86 miles are within wetland and spring RHCAs (Table 80). These miles of road planned for decommissioning proposed for trail conversion were not

included in miles of road proposed for decommissioning within the sediment delivery zone of streams or within the GDE RHCAs or the associated road densities reported in Table 78 and Table 79.

Table 80. Deep Creek Restoration Plan planned decommisioned roads converted to trail.

Road	Subwatershed	Trail Class		Miles of Road Converted	
		Alt 2 & 4	Alt 3	Alt 2 & 4	Alt 3
FS 1200-504	Jackson	III	-	0.43	0
FS 3000-802	Jackson	I	III	0.92	0.92
FS 3000-930	Jackson	III	III	1.5	1.5

Overall, cumulative effects to road/trail densities within the sediment delivery zone of intermittent and perennial streams in the Ochoco Summit project area do not increase appreciably from the direct/indirect effect road/trail densities. The Deep Creek Restoration Plan planned road decommissioning has the cumulative effect of reducing road densities within the sediment delivery zone of streams from an existing condition road density of 6.25 miles per square mile to 5.61 miles per square mile for the no action alternative, Alternative 1. Alternatives 2, 3 and 4 all increase road/trail densities in the sediment delivery zone to streams relative to the no action alternative. Alternatives 2 and 4 have higher road/trail densities in the Upper North Fork Crooked River Watershed and the Deep Creek Watershed relative to Alternative 3 and the no action alternative. In the Upper Ochoco Creek Watershed; however, Alternatives 3 and 4 have higher road/trail densities within the sediment delivery zone as compared to Alternatives 1 and 2.

Overall, cumulative effects to road/trail densities within the wetland and spring RHCAs in the Ochoco Summit project area do not increase appreciably from the direct/indirect effect road/trail densities. The Deep Creek Restoration Plan planned road decommissioning has the cumulative effect of reducing road densities within wetland and spring RHCAs from an existing condition road density of 4.98 miles per square mile to 4.70 miles per square mile for the no action alternative, Alternative 1. Alternatives 2, 3 and 4 all increase road/trail densities in the wetland and spring RHCAs and have almost equivalent densities relative to the no action alternative. In the Upper Ochoco Creek Watershed; however, Alternatives 3 and 4 have higher road/trail densities within the GDE RHCAs as compared to Alternatives 1 and 2.

Livestock grazing occurs across the Ochoco Summit project area within the Ochoco National Forest. Recently, improvements to grazing management were made, as described in the Marks Creek Allotment Management Plan. Implementation of this plan should improve grazing impacts to streams; however, cattle would likely use some of the user-created trails across the Ochoco National Forest. Cattle use of these user-created trails would reduce the number and miles of trail that would revegetate over time without active decommissioning; potentially maintaining existing levels of sediment delivery from user created trails.

Based on estimated negligible increases in the overall road/trail densities in the sediment delivery zone of streams and in GDE RHCAs in the watersheds with future and ongoing projects, cumulative effects from future and ongoing projects to the sediment delivery and turbidity increases are anticipated to be negligible. In addition, since increased peak flows are not anticipated to be cumulatively increased by planned future and ongoing projects, cumulative increases in bank erosion are also not anticipated. In the Deep Creek Watershed, planned road decommissioning would decrease road/trail densities in sediment delivery zones and GDE RHCAs; however, approximately 3.4 to 4.7 miles of road planned for decommissioning in the Deep Creek Watershed is proposed to be converted to trail by the Ochoco Summit Project. Essentially, there are no measurable increased cumulative effects beyond those effects described in the “Direct and Indirect Effects” section relative to the flow and sediment regimes within the watersheds that overlap the Ochoco Summit project area, in part as a result to planned road decommissioning.

Conclusion

Flow and Sediment Regime

Increases in overall subwatershed road/trail densities and stream crossing densities have the potential to increase connectivity between roads, trails and streams resulting in higher peak flows and changes to peak flow timing. Ochoco Summit Project proposed trail systems would have the effect of increasing road/trail and stream crossing densities in most of the subwatersheds analyzed in the project area for at least one of the alternatives, with the exception of the North Wolf Creek Subwatershed. Since miles of existing user created trails by subwatershed are unknown, these are not accounted for in road/trail density estimates and likely would affect these results. Overall, it is anticipated that by designating OHV trails, the total miles of trail across the Ochoco National Forest would decrease over time as user created trails revegetate in the long-term (15+ years). Some of these trails; however, would continue to effect flow and sediment regimes in subwatersheds across the Forest until active decommissioning is implemented.

Table 81 illustrates the magnitude of density increases or maintenance of current road/trail or stream crossing densities resulting from Alternatives 2, 3 and 4 relative to the no action alternative. The largest increases in both road/trail and stream crossing densities across analyzed subwatersheds exist as a result of Alternative 4, followed by Alternative 2, then Alternative 3. Alternative 1, the no action alternative, would not increase road/trail densities or stream crossing densities; however the user-created trails would continue to exist and potentially expand. Similar increases in the magnitude of both road/trail densities and stream crossing densities result from both Alternatives 2 and 4 in all of the Upper North Fork Crooked River Watershed subwatersheds. The Howard Creek Subwatershed has similar increases in densities for all three alternatives. The largest increases in both road/trail densities and stream crossing densities occur as a result of Alternatives 2 and 4 in the Porter Creek Subwatershed and as a result of Alternative 4 in the Upper Marks Creek Subwatershed. Both of these subwatersheds have poor existing conditions relative to flow/sediment regimes.

Cumulative effects from future and ongoing projects to the sediment and flow regimes are anticipated to be negligible based on estimated EHA values from vegetation management projects and almost negligible increases in the overall road/trail and stream crossing densities in the watersheds with future and ongoing projects. In addition, due to the large departure between EHA values and LRMP thresholds, it is unlikely that the implementation of the Ochoco Summit trail systems would increase EHA values above LRMP thresholds. Essentially, there are no measurable increased cumulative effects beyond those effects described in the “Direct and Indirect Effects” section relative to the flow and sediment regimes within the watersheds that overlap the Ochoco Summit project area.

Sediment/Turbidity

Increases in road/trail densities within the sediment delivery zone of perennial and intermittent streams and within RHCAs of wetlands and springs have the potential to increase sediment delivery and turbidity increases in streams and habitat quality in both streams and wetlands in the Ochoco Summit project area. Ochoco Summit Project proposed trail systems would have the effect of increasing road/trail densities in stream sediment delivery zones and GDE RHCAs in most of the subwatersheds analyzed in the project area for at least one of the alternatives, with the exception of the North Wolf Creek Subwatershed. Since miles of existing user created trails by subwatershed are unknown, these are not accounted for in road/trail density estimates and likely would have effect on these results. Overall, it is anticipated that by designating OHV trails, the total miles of trail near streams and wetlands would decrease over time as user created trails revegetate over time. Some of these trails; however, would continue to effect sediment delivery and turbidity levels in streams and wetlands across the Forest until active decommissioning is implemented.

Table 82 illustrates the magnitude of density increases or maintenance of current road/trail densities resulting from Alternatives 2, 3 and 4 relative to the no action alternative. The largest increases in road/trail densities within stream sediment delivery zones and GDE RHCAs exist as a result of both Alternatives 2 and 4, followed by Alternative 3. Alternative 1, the no action alternative, would not increase road/trail densities. Similar increases in the magnitude of both road/trail densities result from both Alternatives 2 and 4 in the Howard Creek, Porter Creek, Little Summit Prairie, and Lower Deep Subwatersheds. Alternative 3 has similar increases to both Alternatives 2 and 4 in the Little Summit Prairie and Lower Deep Subwatersheds. In the Upper Marks Creek Subwatershed, increases in road/trail densities in stream sediment delivery zones and GDE RHCAs are similar for Alternatives 3 and 4, which is more than the proposed action, Alternative 2. The largest increases in both road/trail densities and stream crossing densities occur as a result of Alternatives 2 and 4 in the Howard Creek Subwatershed, which has a fair overall sediment/turbidity existing condition.

Some specific locations where decommissioned roads are proposed to be converted to trail may result in site specific sediment delivery concerns to streams in the Ochoco Summit project area. Alternatives 2, 3 and 4 propose to convert roads decommissioned in Deep Creek Watershed as part of the Deep Creek Restoration Plan to trails. In addition, roads decommissioned in the Peterson Creek Subwatershed as a result of risks related to the Maxwell Fire, are planned to be converted to trail in Alternatives 2 and 4. In addition, Alternative 2 proposes a 2 mile jeep crawl up a steep slope with High Slope Erosion Hazard that crosses two ephemeral streams multiple times. These site specific concerns are listed in Table 83 and the associated subwatersheds, road numbers, miles within Sediment Delivery Zones, Slope Erosion Hazard, proposed trail class by alternative, proximity to the stream, and flow regime. Alternative 3 has the least number of site specific concerns and all trails proposed within areas of concern are Class III trail motorcycle trails, which are expected to have the least impact of all three trail classes. Project Design Criteria should mitigate to some extent erosion and sediment delivery to the stream channel by requiring outlsloping and hardening approaches to stream crossing, installing rolling dips to disperse water from the trail, by reducing the number of locations where OHVs can cross intermittent and perennial streams, and by reducing the density of trails within the sediment delivery zone (300 feet); however, in particularly sensitive areas where trails are located in close proximity to the stream channel (i.e. <200-300 feet) sediment delivery to the stream remains a potential concern.

Table 81. Flow and sediment regime summary of direct/indirect effects by alternatives.

Watershed	Existing Condition Flow/ Sediment Regime Rating	Sub-Watershed	Ochoco Summit Direct/Indirect Effects					
			Alternative 2		Alternative 3		Alternative 4	
			Road/ Trail Density	Stream Crossing Density	Road/ Trail Density	Stream Crossing Density	Road/ Trail Density	Stream Crossing Density
Lower Beaver Creek	Fair	North Wolf	→	→	→	→	→	→
Upper North Fork Crooked River	Poor/Fair	Elliot	↗	↑	↗	↗	↗	↑
		Howard	↑	↗	↑	↗	↑	↗
		Peterson	↑	→	→	→	↑	↗
		Porter	↑	↑	↗	↗	↑	↑
Deep Creek	Good	Jackson	↗	↗	→	↗	↑	↗
		Little Summit Prairie	↗	→	↗	→	↑	→
		Lower Deep	↗	↗	↗	↗	↑	↗
Upper Ochoco Creek	Poor	Upper Marks	↗	→	↑	↗	↑	↑

Arrow direction indicates magnitude of increase in density values: → indicates less than 0.2 mile per square mile increase in density; ↗ indicates an increase of 0.2 to 0.3; and ↑ indicates an increase of greater than 0.3.

Table 82. Sediment and turbidity summary of direct/indirect effects by alternative.

Watershed	Existing Condition Sediment/ Turbidity Rating	Sub-Watershed	Ochoco Summit Direct/Indirect Effects					
			Alternative 2		Alternative 3		Alternative 4	
			SDZ Road/ Trail Density	GDE Road/ Trail Density	SDZ Road/ Trail Density	GDE Road/ Trail Density	SDZ Road/ Trail Density	GDE Road/ Trail Density
Lower Beaver Creek	Fair	North Wolf	→	→	→	→	→	→
Upper North Fork Crooked River	Fair	Elliot	↑	↗	↗	↗	↗	↗
		Howard	↑	↑	↑	↗	↑	↑
		Peterson	↗	→	→	→	↗	↗
		Porter	↑	→	→	→	↑	→
Deep Creek	Fair/Good	Jackson	↗	↗	→	→	↗	→
		Little Summit Prairie	→	↗	→	↗	→	↗
		Lower Deep	↗	↑	↗	↑	↗	↑
Upper Ochoco Creek	Fair	Upper Marks	→	→	↗	↑	↗	↑

Arrow direction indicates magnitude of increase in density values: → indicates less than 0.2 mile per square mile increase in density; ↗ indicates an increase of 0.2 to 0.3; and ↑indicates an increase of greater than 0.3.

SDZ = Sediment Delivery Zone

Table 83. Specific locations with hydrologic concerns.

Subwatershed	Road/Trail Identifier	Miles in SDZ	Slope Erosion Hazard	Trail Class			Proximity to Stream	Flow Regime
				Alt 2	Alt 3	Alt 4		
Petersen Creek	New Trail (2 Mile Jeep Crawl)	0	High	II	-	-	5 Crossings	Ephemeral
	FS 2200-550	0.2	Moderate	I	-	I	1 Crossing	Fish-Bearing, Perennial
Jackson Creek	FS 1200-504	0.4	Moderate	III	-	III	5 – 200 ft (parallels)	Fish-Bearing, Perennial
	FS 3000-802	0.1	Moderate	I	III	I	1 Crossing	Perennial
		0.1					30 – 300 ft (parallels)	Fish-Bearing, Intermittent
	FS 3000-930	0.8	Moderate/ High	III	III	III	25 – 300 ft (parallels)	Fish-Bearing, Perennial
	FS 4250-608	0.1	Low/ Moderate	III	-	III	1 Crossing	Fish-Bearing, Perennial
Lower Deep Creek	FS 4200-600	0.3	Low	I	III	I	1 Crossing/ 15 – 100 ft (parallels)	Intermittent
	FS 4200-603	0.5	High	I	III	I	1 Crossing/ 30 – 120 ft (parallels)	Perennial

Aquatic Species

Threatened, Endangered and Sensitive Species

This section includes the entire Biological Evaluation (BE) for Threatened, Endangered and Sensitive aquatic species in the Ochoco Summit Trail System project area. The BE documents the review and findings of the Forest Service planned programs and activities for possible effects on species (1) listed or proposed for listing by the US Fish and Wildlife Service (USFWS) as Threatened or Endangered; or (2) designated by the Pacific Northwest Regional Forester as Sensitive; or (3) required consultation with the National Marine Fisheries Service (NMFS) under the Magnuson-Stevens Fishery Conservation Act (MSA). It is prepared in compliance with the requirements of Forest Service Manual (FSM) 2630.3, FSM 2672.4, and the Endangered Species Act of 1973, as amended (ESA) (Subpart B; 402.12, Section 7 Consultation). Changes to the R-6 Regional Forester's Sensitive Species List were instituted on January 2008.

Determinations of effects based on the analysis described in this section are listed in Table 84.

Table 84. Determination for threatened, endangered and sensitive aquatic species.

Species	Listing	Alt 1	Alt 2	Alt 3	Alt 4
Bull trout (determined) *Salvelinus confluentus*	threatened	NE	NE	NE	NE
Mid-Columbia River steelhead trout (determined) *Oncorhynchus mykiss ssp.*	threatened	NE	NE	NE	NE
Redband trout *Oncorynchus mykiss* ssp. (determined)	sensitive	NI	MIIH	MIIH	MIIH
Columbia spotted frog *Rana luteiventris* (determined)	sensitive	NI	MIIH	MIIH	MIIH
West Slope cutthroat trout *Oncorhynchus clarki lewisi* (determined)	sensitive	NI	NI	NI	NI
Mid-Columbia River spring chinook EFH *Oncorhynchus tshawytscha*	sensitive	NI	NI	NI	NI
Shortface lanx (Gastropoda) *Fisherola nuttalli* (suspected)	sensitive	NI	NI	NI	NI
Crater Lake tightcoil (mollusk) *Pristiloma arcticum crateris* (determined)	sensitive	NI	NI	NI	NI
Pristine springsnail (mollusk) *Pristinicola hemphilli* (determined)	sensitive	NI	NI	NI	NI

Effects Determinations

Threatened and Endangered Species

- NE — No Effect
- NLAA — May Effect, Not Likely to Adversely Affect
- LAA — May Effect, Likely to Adversely Affect
- BE — Beneficial Effect

Sensitive Species

- NI — No Impact
- MIIH — May Impact Individuals or Habitat, but Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species
- WIFV — Will Impact Individuals or Habitat with a Consequence that the Action May Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species
- BI — Beneficial Impact

Essential Fish Habitat: The Pacific Fishery Management Council designated EFH (Essential Fish Habitat) for chinook salmon on September 27, 2000. The project area does not have (EFH) for Mid-Columbia spring chinook (Magnuson-Stevens Fishery Conservation and Management Act Public Law 94-265). EFH will not be discussed further.

Threatened and Endangered species: Bull trout and Mid-Columbia River steelhead trout are threatened and located on the Ochoco National Forest and Crooked River National Grassland. The

proposed project is not within bull trout watersheds and will have no effect (NE) on threatened bull trout (*Salvelinus confluentus),* or their designated or proposed critical habitats. The threatened Mid-Columbia River steelhead trout (*Oncorhynchus mykiss* ssp) is in Rock Creek, Mountain Creek and Bridge Creek watersheds within the project area (see Table BF-2 on p. 18). A portion of the proposed OHV trail crosses into Rock Creek Watershed in the Bear Creek area, Mountain Creek, Bridge Creek and Rock Creek. Construction of the trail is located on ridges and is not in proximity of steelhead or their habitat and would not contribute sediment into the steelhead streams. There would be no effect (NE) on steelhead trout or their designated or proposed critical habitats. Consultation with NMFS or USFWS is not needed.

R6 Regional Forester sensitive species list: The shortface lanx (*Fisherola nuttalli*), Crater Lake tightcoil (*Pristiloma arcticum crateris*), and Pristine springsnail (*Pristinicola hemphilli*) are on the R6 Regional Foresters Sensitive Species list (January 2008). They are not known to inhabit or have habitat in the project area and will not be discussed further.

Redband trout (*Oncorhynchus mykiss* ssp) historically were present throughout the planning area and can be found in Class I and Class II streams: Allen, Deep, Jackson, Little Summit Creek, Peterson, Beetle, Big Spring, Crazy, Crystal, Derr, Double Corral, East Porter, Elliot, Fox, Happy Camp, Howard, Indian, Looney, Toggle, and West Fork Fox creeks. By following the Project Design Criteria, the proposed trail May Impact Individuals or Habitat, but Will Not Likely Contribute to a Trend towards Federal Listing or Cause a Loss of Viability to the Population or Species.

Westslope cutthroat trout *(Oncorhynchus clarki lewisi)* are not known to occur in the project planning area and will not be discussed further (Westslope cutthroat trout 2011).

The Columbia spotted frog (*Rana luteiventris)* is a candidate species and protected by the USDA programmatic BA Project Design Criteria (USDA 2010-2013). There are currently known populations of Columbia spotted frogs throughout the planning area identified from informal surveys. By following the Project Design Criteria, the proposed trail May Impact Individuals or Habitat, but Will Not Likely Contribute to a Trend towards Federal Listing or Cause a Loss of Viability to the Population or Species.

Affected Environment

OHV project area

The project area includes nine 5th field watersheds: Deep Creek, Lower Beaver Creek, Lower North Fork Crooked River, Paulina Creek, Rock Creek, Bridge Creek, Upper North Fork Crooked River, Upper Ochoco Creek and Mountain Creek.

Table 85 displays watersheds in which effects to streams, ponds, seeps and springs are not anticipated and provides rationale for this conclusion. These watersheds will not be discussed further in the Aquatic Species analysis.

Table 85. Watersheds with proposed trail that do not impact streams, ponds, seeps or springs.

Watershed	Alt. 2 trail miles	Alt. 3 trail miles	Alt 4. trail miles	Rationale why no impact would occur to riparian resources.
Lower North Fork Crooked River	0	0	0	Included in the project boundary; no proposed trails; no impact
Paulina Creek	1	1	1	The trail is along a ridge in the Paulina Butte area. Sediment from rain events or snow would not reach aquatic habitat or species; no impact

Table 85. Watersheds with proposed trail that do not impact streams, ponds, seeps or springs.

Watershed	Alt. 2 trail miles	Alt. 3 trail miles	Alt 4. trail miles	Rationale why no impact would occur to riparian resources.
Mountain Creek	1.28	0.28	1.28	The trail is along a ridge, crossing the watershed boundary and beyond 300 feet of mapped streams; sediment from rain events or snow would not affect aquatic habitat or species as sediment from the trail would not reach streams; no impact
Bridge Creek	0	0	0.37	The trail is along a ridge, on a watershed boundary and beyond 300 feet of mapped streams; sediment from rain events or snow would not affect aquatic habitat or species as sediment from the trail would not reach streams; no impact
Rock Creek	0.89	0.89	0.89	The trail is along a ridge, crossing the watershed boundary; sediment from rain events or snow would not affect aquatic habitat or species as sediment from the trail would not reach streams; no impact
Upper Ochoco Creek Watershed; Headwaters Ochoco Creek Subwatershed	3	1.24	2.95	Trails are not proposed within 300 feet of mapped streams within the Headwaters Ochoco Creek; no impact
Upper Ochoco Creek Watershed; Duncan Creek Subwatershed	0	0.12	0.12	Trail would not actually extend into the Duncan Creek Subwatershed; no impact

Redband trout

Historically, redband trout may have occupied more aquatic habitat within the watershed analysis area than presently. Road densities, livestock grazing, timber harvests, and mining have contributed to a reduction in suitable habitat and increased fish passage barriers. Ochoco Dam and other non-passable irrigation diversions contribute to fragmentation of native redband trout populations. This further increases risk for localized extinctions and can limit the long-term sustainability of these native trout populations.

Redband trout typically inhabit cooler, well-oxygenated water that is less than 70°F, although they tolerate a wider range of water temperatures (from 32°F up to 80°F) better than many other salmonid species (Wydoski and Whitney, 1979). Current research indicates that redband trout have developed phenotypic traits that allow them to tolerate marginal trout habitats in the high desert areas of Oregon (Rodnick et. al., 2004; Gamperl et. al., 2002). Despite various phenotypic traits, the preferred temperature for optimum metabolic performance in redband is 55.4°F (Gamperl et. Al., 2002) and the upper lethal temperature limits are 84.7-85.1°F, very similar to temperature profiles observed in most other Oncorhynchus species (Rodnick et. al., 2004).

Redband trout typically spawn between March and the end of June depending on water temperatures and timing of spring runoff. Egg deposition occurs in stream areas that have adequate water depth and velocity and appropriate sized gravels for redd construction. Water temperatures influence the number of days eggs incubate in the gravel before fry emergence. During the fry and parr life stages, redband trout are often observed along stream margins in slower waters. Adults are most often observed in pools near large wood or available cover. Food sources for young and adults include aquatic insects, amphipods, fish and eggs and adults may also eat crustaceans when they are available (Wydoski and Whitney, 1979).

Columbia spotted frog

Historically the Columbia spotted frog was found at elevations ranging from near sea level to 7,370 feet. Their range extended from southeast Alaska through British Columbia, eastern Washington and Oregon to northeast California and eastward to western Montana and Wyoming, and northern Utah. Columbia spotted frogs have been found throughout the Ochoco National and are present within the project area.

Columbia spotted frogs are highly aquatic, thus they are generally found in close proximity to water in riparian habitat. In winter months, the frogs burrow into mud in wet meadows or in streams. They breed in shallow water areas such as stream margins or pond edges, flooded meadows, or in pools of water formed by snow melt from early March through the end of May. Timing of breeding is dependent on snowmelt and rising water temperatures. After hatching, the larval stage (tadpole) remains in the water until metamorphosis into the adult form. Adults utilize both water habitat and nearby riparian areas for foraging and refuge needs.

Parameters

Analysis of INFISH Riparian Management Objectives concerning pools and sediment will be discussed in this section. Sediment is not an INFISH RMO but will be addressed as it affects water quality and aquatic species and their habitat. Miles of trail within the ground water dependent ecosystem and HRCAs will be analyzed for impacts to pools, sediment, and temperature to streams.

Existing Condition

For the purposes of this analysis, only streams of Class I, II, III, or IV streams are considered functional streams. Class V (or VIIII) streams are ephemeral draws that do not have established beds and banks and often are covered with vegetation. Ephemeral streams do not routinely transport sediment.

Project area watersheds that contain Class I fish–bearing streams include Deep Creek, Lower Beaver Creek, Upper North Fork Crooked River, and Upper Ochoco Creek subwatersheds. These subwatersheds include the following Class I and II streams: Allen Creek, Deep Creek, Elliot Creek, Fox Creek, Jackson Creek, Little Summit Creek, Marks Creek, East Fork Allen Creek, North Fork Crooked River, Ochoco Creek, Peterson Creek, and Toggle Creek. Approximately three quarters of the fish-bearing streams in the project area watersheds are located in Upper North Fork Crooked River and Deep Creek Watersheds.

Watersheds in the project area have impacts from past grazing, mining, wood cutting, dispersed camping, hunting, fishing, campgrounds, snowmobiling, road building, timber harvest, unmanaged OHV use, wild horses, and wildlife.

Lower Beaver Creek Watershed

North Wolf Creek Subwatershed

North Wolf Creek is a perennial spring fed tributary of Wolf Creek. North Wolf Creek is approximately 11.5 miles in length and only the upper 6.3 miles flow within the Forest boundary. North Wolf Creek has been heavily utilized for its resources, i.e. livestock grazing, logging, camping, hunting, and fishing. Redband trout (both adult and fry) and Columbia spotted frogs have been observed.

North Wolf Creek is a Class II to river mile 4.8 from the US Forest boundary and Class IV for the last 1.5 miles of the headwaters on the mainstem. Total shade and hardwood shade did not reach or exceed 80% of the surface shade in any reach. Reach 1 was the highest with 65.9%; Reach 2 had the only measurable hardwood shade of 0.5. Reaches 1, 2, and 3 were 18 to 23% below Forest Plan standards for shade. Large wood was below 1 piece of wood per mile in all log classes and did not

meet the Forest standard. Multiple headcuts are found in all reaches with heights from 0.5 ft. to 4 ft. high. Multiple gullies are present in Reaches 2 and 3 with high headcuts (4 ft. high) and with engulfing cutbanks (100 ft.+ long by 4 ft. high).

Upper North Fork Crooked River Watershed

Elliot Creek Subwatershed: Elliot Creek is a Class II stream that flows from north to south into the Big Summit Prairie (private property). In 1996, Bottom Line Survey was completed on Elliot Creek. Elliot Creek is a perennial stream that originates approximately 3.5 miles upstream from the FS boundary fence on the north end of Big Summit Prairie.

Referenced in the BAER 2006 report for the Maxwell Fire, Forest Road 2200-505, a ford located on a tributary to Elliot Creek was designed to keep storm flow within channel areas (BAER 2006 Engineering Report). Fine sediments >20% can be found in the crossing and downstream from OHV fording the closure.

For general morphological and vegetative comparisons, Elliot Creek can be divided into two reaches. The top reach, reach 2, starts in a draw and flows through a trough-like valley of mixed conifer: ponderosa pine, Douglas and white fir. There are many undercut banks and debris jams. Sporadic alders give ample hardwood shade where present. There is minimal large woody debris, but where there is, it has been placed by the equipment and hand crews. Cattle damage is extreme on the creek. Banks have sloughed off into the channel. Banks are trampled and lack definition causing heavy sediment to the stream. There is a fence 1/4 mile upstream from FR 22 and a cattle crossing that is also causing heavy sediment into the creek due to the heavy cattle traffic through the stream. This area needs restoration to improve fish habitat.

Reach 1 flows from FR 22 south through a very broad, flat-bottomed valley of ponderosa pine. Cattle impact is extreme in this reach. Grass has been grazed to 1-2", banks are sloughed and trampled, and there is very minimal hardwood such as alders. Redband trout, speckled dace, and frogs were observed throughout the entire length of the stream. An elk exclosure 1700' upstream from the boundary fence was not surveyed, but vegetation inside appeared good. Overall, this stream offers fish habitat, yet is in very poor condition due to grazing and past timber harvests.

Shade from hardwoods was 25%. Total shade was 59%; 80% being potential.

Pools in reach 1 were 0.9/100 feet and in reach 2 were1.0/100 feet. Pools are below the objective of 1.8 pools per 100 feet (Rosgen 1996).

Field observations by the Fishery Biologist and Hydrologist (8/10/10) indicate from walking approximately 1 mile of the stream north to south (to FR 22), (equivalent to reach 2 in the 1996 Bottom Line Survey) that the stream is a perennial Class II stream with 1 or less cfs for flow, has fish presence, and is a spring dominated system. Streambanks are impacted by grazing with postholing, hedged alder, and removal of riparian vegetation. The cut streambanks appear to be sheered by livestock recognized by their hoof prints. The stream is downcut from loss of vegetation. There is evidence of significantly more flow during spring runoff or high rain events including well developed pools and areas where overflow channels were accessed. Sediment deposition on the substrate indicates continuous sediment inputs from cut streambanks.

Current data for pools, temperature and sediment are unknown until the 2010 survey is completed and data is analyzed.

Howard Creek Subwatershed: Howard Creek is a perennial tributary to the North Fork of the Crooked River. The contributing area to Howard Creek is juxtaposed between Round Mountain to the southwest, Ochoco Butte to the North and West, and Mount Pisgah to the North and East. The subwatershed drains into Big Summit Prairie from the Northwest. The East and West Forks of Howard Creek join together to form the main stem of Howard Creek. As a fourth order subwatershed

with greater than 90% of its area above the transient snow zone, it is a major hydrologic contributor to the North Fork Crooked River.

Flow from the edge of the Big Summit Prairie to the confluence with Johnson Creek was measured at 2-3 cfs on August 22, 1978 (Frey, et al. 1978) and 2.4 cfs 1/8 mile upstream from FR 22/300 junction on August 27, 1994. Flows were estimated during the 2001 stream survey to be around 2 cfs. Columbia spotted frogs were observed.

All age classes of redband trout were represented in 1994 and 2001 electrofishing surveys (USDA 1994, 2001). The 1978 physical and biological survey (Frey et al. 1978) suggested similar distribution.

Howard Creek is important as spawning, rearing, and adult habitat for redband trout. Pool habitats met their potential within the reaches surveyed. Changes have occurred in the size and type of pools described in the 1994 survey due to loss of beaver created dam pools. The increase in cutbank percentage may reflect the loss of beaver dams in the lower ½ mile of Howard Creek.

Total shade and hardwood shade potential is 80%. Stream survey indicates shade averaged 59% for reaches 1, 2, and 3. Pools averaged 65 (1.45/100'averaged) and met optimum of 47 to 65 pools based on 5-7 times bankful width (Rosgen 1996). Cutbank length has increased by as much as 10% in the first half mile of reach 1; however, loss of beaver ponds may explain this increase and should be a temporary phenomenon. Reaches 2 and 3 are approximately the same as in 1994.

Peterson Creek Subwatershed: Peterson Creek is a stream Class I perennial tributary which originates from Peterson Spring and flows south-westerly approximately 10 miles to the Forest boundary near Peterson Creek Reservoir. The final 3.0 miles flow through private properties on Big Summit Prairie to the confluence with the North Fork of the Crooked River. In addition to Peterson Spring, Peterson Creek gains significant flow from several spring-fed tributaries: McCarthy Spring which contributes 15% flow, Zane Spring tributary which contributes 60% flow. Water influx from seepage also adds significant flow to the stream and assists in temperature regulations.

Stream characteristics in Peterson Creek varies from Rosgen channel type C in reaches 1-5 to G in reach 6 to deep gullies. This later half is significantly eroding in many areas. Headcuts and fish barriers exist throughout reach 6 (USDA 2007).

In 2007, the number of pools/mile met the minimum desired condition only in reach 1. Medium and large wood per mile was sufficient in all 6 reaches. Percent stable bank was sufficient in all reaches except for reach 6.

Although survey protocols differ, some comparisons can be made between the 2007 survey results and those from the 1994 Bottom Line Survey. In general, shade has increased in all reaches. Most notably, the amount of cutbank per 100 feet has increased in all 6 reaches, dramatically so in reach 6, which displays a downward trend for streambanks.

In general, despite very low shade and heavy cattle impacts, Peterson Creek has high quality fish habitat in the lower eight miles surveyed. Peterson Creek is a stream Class II to the road crossing at the 2630 and a stream Class III thereafter.

Allen Creek is a perennial stream originating on the southeast flank of Mt. Pisgah, generally flowing from the northwest to the southeast into Johnson Creek, into the Big Summit Prairie. Allen Creek is entirely underlain by Picture Gorge Basalt. Average annual precipitation is approximately 19 inches; primarily from winter snow fall. Discrete springs, seeps and tributaries contribute to the stream flow. An unnamed tributary entering at the upstream end of reach 5 contributes approximately 95% of the flow. The landform surrounding Allen Creek is unconfined in Big Summit prairie, transitioning to a confined V-shaped valley in reach 3. Allen Creek begins as a C4b/C5b transitioning to an A5-type channel in reach 3. Average mapped stream gradient is 4.4%.

From the 2002 Level II stream survey, shade averaged 71.6% not meeting the standards greater than 80%. Reach 2 met the standard for shade with 81.1%. Unstable banks averaged 36.3%, which exceeds the standard of no more than 20% to 30% (Bjornn, et. a. 1977.).

Pools for Allen Creek met the standard (Rosgen 1996). The survey was completed in 2002, before the Maxwell Fire. Because of increased sediment from the fire (BAER 2006), it is likely the pool standard is no longer being met. Surveys have not been completed to verify the effects of the fire on pool numbers.

When the Maxwell Fire occurred in 2006, BAER reports described Allen Creek as a value at risk. Allen Creek vegetation had been removed from the streambanks and in the RHCAs as a result of the fire. Sedimentation during the runoff during snow melt in the spring of 2007 increased from the loss of filtering vegetation from the RHCAs. Riparian vegetation adjacent to the channel no longer provided protection from temperature increases, bank failure or sediment additions to the channel after the fire.

Field observations indicate that most of the shade was lost in moderate to high fire severity polygons, with most of the shade coming from standing dead trees. Approximately 4 miles of perennial streams in the Maxwell Fire burned at moderate to high severity. Fish bearing reaches included, 0.4 miles of Allen Creek, and 1.9 miles of East Fork Allen Creek burned at moderate to high severity (BAER 2006 Hydrology Report).

Fire intensities affected the streams within the Maxwell Fire boundary including Allen Creek and East Fork Allen Creek by reducing vegetation and increasing sedimentation and bank instability. Increased sediment and ash may adversely affect redband and Columbia spotted frog populations. Downstream effects would include: increased sedimentation that will reduce available macroinvertebrates (food for fish) and reduce success of spawning for redbank trout and breeding for Columbia spotted frogs.

Prior to the fire, Allen Creek Watershed contained natural barriers with brush and downed woody debris that restricted off road travel in RHCAs. New off road vehicle stream crossings, since vegetation removal by fire, are increasing sedimentation from the disturbance and driving over streambanks that lack vegetation. Fish and frog populations need continued protection from loss of streambank vegetation until riparian vegetation has reestablished throughout the fire area (BAER 2006).

The culvert at Allen Creek (FR 2200-550) was removed and streambanks recontoured (BAER 2006) to reduce the potential for accelerated surface runoff that would increase sediment delivery to downstream high value fisheries habitat, high value water quality. Vegetation in the headwaters was burned in the fire reducing the ability of the watershed to filter sediment before reaching the stream channel.

Since 2007, streamside and riparian vegetation throughout Allen Creek and the East Fork Allen Creek is becoming reestablished. The vegetative recovery period was estimated to be 7 years based on WATSED tables (Maxwell BAER 2008 Hydrology Report), which would be at the end of the 2013 growing season. Vegetation will have 5 growing seasons at the end of 2012 for reestablishment since 2007. Surveys have not been completed since the Maxwell Fire. The progress of streamside and riparian vegetation will need to be monitored to determine stable vegetation recovery. Before and after the Maxwell Fire, visual observations of redband trout and Columbia spotted frogs were in Allen Creek and the East Fork of Allen Creek.

Porter Creek Subwatershed: Porter Creek is a Class II stream and a major tributary of the North Fork Crooked River. The stream originates from Porter Spring and flows approximately 10.3 miles all of which lies on LOM district.

Porter Spring begins in a small meadow area for approximately 0.25 miles then enters an area wooded with Douglas-fir, grand fir, and Western larch. The next 3.5 miles vary from small meadows to areas heavily wooded with ponderosa pine, cottonwood, and fir spp. The creek flows through an aspen stand for approximately 0.5 mile near the FR 30 rd. For the next 4.35 miles the creek flows through large diameter ponderosa pine and scattered Douglas-fir. The last mile of the creek has similar vegetation with the addition of hardwood vegetation (mainly red alder) along the banks.

Both redband trout and dace were observed in Porter Creek. Sizes ranged from 1" up to 12" in length. Fish were detected in all three reaches surveyed. Columbia spotted frogs and garter snakes were also observed. Cattle impacts were most notable in reach 2. The exclosure around the cottonwoods in this section was non-functioning and mostly dead. There was significant bank damage due to cattle crossing, post-holes, and hoof-shear damage in reaches 2 and 3.

In 2007, the number of pools/ mile did not meet the minimum desired condition in any reach.

Percent fines is greater than 20%. Bjornn et. al (1977) found that when the percentage of fine sediment exceeds 20% to 30% in spawning riffles, the survival and emergence of salmonid embryos begin to decline.

Deep Creek Watershed

Deep Creek includes Lower Deep Creek, Jackson Creek, Little Summit Prairie Creek, Crazy Creek including East and West Forks, Happy Camp Creek, Double Corral Creek, and Toggle Creek in the project area. Deep Creek and its tributaries provide some of the premier trout fishing opportunities in the region due to its diverse, relatively intact nature and abundant cold water and spring creeks entering throughout the watershed. The only resident native salmonid species is the redband trout. Columbia spotted frogs are present throughout the area.

Water quality and fish habitat have declined due to increased sediment yields and stream temperatures, and reductions in pool habitat (USDA 2009). Many stream channels have widened and incised within the flood plain, effectively lowering the water table and reducing the amount of area available to support riparian vegetation that trap sediment, stabilize stream banks and lower water temperatures. The lowering of the water table allows soils to dry out, leading to a shift in vegetation composition from deeply rooted riparian species to shallow rooted, less desirable ones (Whisenant, S.G.1999). Furthermore, fire suppression activities have led to the encroachment of conifers in the riparian areas, replacing desirable riparian plant species (willows, sedges, and rushes) that provide soil/bank protection and shade with less shallow rooted plant species (USDA 2009).

The past century of use of forest lands within the Deep Creek Watershed has contributed to a decline in stream health, as well as trout and frog populations. Past and present activities within this watershed include timber harvest, domestic livestock grazing, big game management, recreation, fire suppression, off road travel and road construction. Water quality and fish habitat have declined due to increased sediment yields and stream temperatures, reductions in pool habitat and in-stream woody debris, and reduced upstream accessibility by aquatic species.

Table 86 displays the current physical attributes of streams surveyed within the Deep Creek Watershed. Bold characters indicate condition does not meet INFISH standard.

Table 86. Existing stream conditions in the Deep Creek Watershed.

Streams Surveyed by Reach	Class	Miles surveyed	% Shade	Pools/100ft (1.8)	Fish Present
Deep					
1	I	1.6	**30**	**0.4**	y
2	I	3.9	**40**	**0.5**	y
3	I	2.7	**44**	**0.3**	y

Table 86. Existing stream conditions in the Deep Creek Watershed.

Streams Surveyed by Reach	Class	Miles surveyed	% Shade	Pools/100ft (1.8)	Fish Present
Lt. Summit					
1	I	0.8	82	2.6	y
2	I	1.0	**62**	2.3	y
3	I	2.6	**29**	**1.7**	y
5	II	0.8	**55**	2.8	y
6	II	0.4	**74**	4.0	y
7	III	0.7	**54**	**1.5**	n
8	IV	1.6	**56**	**0.1**	n
Jackson					
1	I	2.5	**28**	**0.9**	y
2	I	2.1	**34**	**0.4**	y
3	I	0.9	**29**	1.9	y
4	II	1.5	**20**	2.6	y
5	III	1.4	**41**	**0.6**	n
6	IV	0.5	**36**	**0**	n
Crazy					
1	II	1.5	**47**	2.1	y
2	II	2.4	**47**	**0.5**	y
E Fk Crazy					
1	II	1.6	**59**	2.0	y
2	IV	0.7	**38**	**0**	n
W Fk Crazy					
1	II	1.7	**46**	1.8	y
2	III	1.1	**36**	**0.1**	n
Happy Camp					
1	II	1.1	**53**	**1.4**	y
2	II	1.6	**39**	**1.3**	y
3	II	0.9	**18**	**1.2**	y
4	II	3.2	**32**	**1.7**	y
5	IV	1.1	**45**	**1.4**	n
Double Corral					
1	II	2.8	**33.4**	3.5	y
2	II	2.5	**17.0**	**1.6**	y
Toggle					
1	II	0.8	**31.1**	**1.1**	y
2	II	1.9	**19.1**	**1.4**	y
3	II	1.3	**22.5**	**1.4**	y
4	IV	1.9	**18.2**	**1.2**	n

Upper Ochoco Creek Watershed

Upper Marks Creek Subwatershed: Marks Creek drainage has been subjected to a variety of anthropogenic impacts including: grazing on both private and public lands, culvert placement, reservoir construction on private land, impingement of road fills on active flood plains, water diversion, channel straightening, logging (clear cut or overstory removal, intermediate cut), precommercial thinning, road construction, housing development, and off road travel. These activities alter sediment and hydrologic inputs and outputs, creating changes in channel dimension, planform, and longitudinal profile. Marks Creek has gone through periods of adjustment to accommodate these

changing water and sediment inputs and outputs. Cattle alter this meadow creek as it adjusts to impacts of bank trampling and vegetation removal.

Marks Creek is a high value fishery that requires using level III monitoring surveys to ascertain if and how further entrenchment is advancing. Columbia spotted frogs have been observed in Marks Creek. Changing grazing strategies has helped to recover vegetation, but if channel dynamics are tending toward further entrenchment, loss of the hydraulic capabilities of this channel will tend to dry out riparian margins, and vegetation communities will change to more mesic or xeric species.

Stream shade averaged 24% in the 1996 survey and only 1.8% of the shade was provided by hardwood shrubs. There are signs of hardwoods increasing in the downcut channel with improvements in grazing. Looking at the differences inside and outside of the fenced areas (exclosures) on Little Hay Creek and Marks Creek, potential for riparian vegetation is 80%.

Main channels are counted in this survey to assess geomorphic process and to relate this to fisheries habitat quality. The 1999 survey shows 0.38 pools/100 feet and 1992 data shows 0.57 pools/100 feet. Pools should meet 1.25 to 1.2 pools/100 feet (Rosgen 1996). Pool numbers have reduced from 1992 to 1999 survey data. Data for survey in 2010 have not been completed to display current pool trend.

Pebble counts in the 1999 survey data indicate that Reaches 1 and 2 have suitable substrate for fish habitat with 20% or less fines. These reaches start at FR2610 and end upstream to FR2600-105. Reach 3, FR2600-105 upstream to FR2600-201 (just downstream from private land) pebble counts indicate fines exceeding 20% (data indicate 30% and 40%).

Headwaters Ochoco Creek Subwatershed: Ochoco Creek is a perennial fourth order stream tributary to the Crooked River. The axis of this watershed trends from northeast to southwest throughout its length. From the Forest boundary near the Ochoco Ranger Station, the longest axis of the drainage is approximately 6.6 miles, averaging a 4.2 % slope over this distance (1480’ elevation change). Approximately 60% of the drainage above the Forest boundary is above 5000’ in elevation (transient snow zone).

Upper Ochoco Creek is east of Round Mountain and is fed by a number of tributaries: Canyon Creek, Coyle Creek, McAllister Creek, Ahalt Creek, Judy Creek, Scissors Creek, and Fisher Creek.

Resident redband trout were noted in surveys conducted in 1979 and 1993 approximately 700 feet upstream from FR 22 crossing that includes reach 1 and beginning of reach 2. In the 1999 survey, redband trout were noted up to the end of reach 2, an additional 3.7 miles. Columbia spotted frogs have also been observed.

Pool frequency from the 1999 survey indicates there are 24 total pools in reach 1 (0.7 mi.) and 63 total pools in reach 2 (5.8 mi.). Pools are deficient as there should be 37 to 52 total pools in reach 1 and 232 to 348 total pools in reach 2 (Rosgen 1996). Pool frequency from the 1993 survey indicates there are 46 total pools in reach 1 (0.5 mi.) and 48 total pools in reach 2 (5.6 mi.). From 1992 to 1999, there are fewer pools when comparing by equivalent miles. Pool counts in 1992 and 1999 do not meet the standard.

The pebble counts indicate that fines are below 20% in reaches 1 and 2, adequate for good fish habitat.

Analysis of photos taken in 1968 shows that Ochoco Creek has decreased in width and increased in average depth. The vegetation component has changed from dry grasses and minimal alder vegetation to dense and deeply rooted riparian vegetation. These factors have likely reduced overall temperatures and the diurnal temperature flux throughout the warm season. Temperatures from data in 1992 indicate 48 degrees F and 1999 62 degrees F, an increase in temperature yet good habitat for redband trout.

A major concern to water quality in the watershed is heavy metals from old mining operations in the Headwaters Ochoco Creek Subwatershed. The mine tailings in Ochoco Creek above McAllister Creek at the old Ochoco Mine are a very high risk.

Environmental Consequences

Effects Common to All Alternatives

Since erosion risk from ATV/OHV trails has been shown to potentially equal that of a forest road network, it can be expected that trails have the potential to increase drainage densities and peak flows similar to forest roads (Meadows et al., 2008). Areas with high road densities, high drainage densities, and a high density of stream crossings typically result in higher connectivity of the road and stream network. Until user created routes, breeched closed roads, and use of decommissioned roads have revegetated, impacts by those trails that have crossed streams through fords and routes that run parallel to streams will contribute sediment into the substrate of streams impacting quality of pools and spawning areas.

Henderson Flat on the Crooked River National Grassland and the Green Mountain Trail on Lookout Mountain Ranger District are the only designated OHV trails on the Ochoco National Forest. Although cross-country vehicle travel is restricted to designated routes, user created routes continue to be used.

Unmanaged OHV travel in streams directly affects redband trout and Columbia spotted frog species during critical life stage periods. Fish and frog harassment can occur during critical spawning and breeding periods if trails or routes are adjacent to or cross spawning and breeding habitats. Spawning and breeding occurs between March 1 and May 31 for Columbia spotted frogs (USDA/USDI 2009-2010) and March to end of June from redband trout, spawning to fry emergence. Cool clean well oxygenated water is necessary for eggs to survive. At stream crossings (fords), OHVs can directly affect fish by crushing redds (areas containing fish eggs, in spawning reaches) and vegetation where frogs breed and eggs hatch, and change substrate size at the crossings, altering habitat, and increasing sediment.

After the user created routes and closed roads are no longer used by OHVs, it is estimated to take a minimum of 10 years to reestablish filtering vegetation. In areas where it is not a moist site, it is estimated to take 15 or more years. On scab areas, it may not reestablish its vegetation (District Botanist 2010). In areas where roads are rutted and the water table has dropped, weeds will replace the vegetation removed from off road travel. Maintenance of these routes is not proposed.

Project Design Criteria would help reduce sediment that could enter streams as a result of establishing an OHV trail, as would having culverts or bridges for crossings instead of fords through Class I, II, and III streams. Fords or culverts would be on Class IV crossings. Approaches to stream crossings would be hardened to reduce the sediment entering streams. Crossings would meet the 100-year flood and aquatic passage specifications (see Project Design Criteria, Chapter 2 of this document). Proposed design criteria would reduce the effects of sediment to streams over user-created routes that do not have proper drainage.

Turbidity reduces the penetration of sunlight into the water that may affect the primary producers such as algae, phytoplankton, and other aquatic plants; thus potentially limiting photosynthetic activity, which many organisms depend on for survival (Kolbe and Luedke, 1993). Suspended solids can settle over eggs and redds (fish nests) resulting in lower reproductive rates, and disrupt the food base filling the interstitial spaces between larger substrates such as gravel and cobble rendering this habitat as marginal at best for those macroinvertebrates (food for fish) which typically reside in these spaces. The changes in the physical characteristics of streams and rivers can critically affect aquatic insects, fish, frogs and other animals that depend upon clear cold waters for habitat, spawning, or food (Havlick, 2002).

Proposed season of use (May 1 to November 1) overlaps with redband spawning by 2 months for emergence and 1 month for breeding frogs. The exception would be trail that is located within the Rager Cooperative Travel Management Area (TMA), is a green dot system managed by the Oregon Department of Fish and Wildlife (ODFW) the Forest Service and Oregon State Police. The TMA map identifies a network of open and closed roads in the eastern portion of the analysis. For the most years, the wet season will generally start in mid-October. The actual closure to motorized travel other than on open roads would extend through snow melt to the opening date of the season of use. Generally the season of use under Alternatives 2 and 4 would open on May 1; exception: open on June 1 under Alternative 3 in the area north of Big Summit Prairie. Maintenance and construction of crossings and approaches of the trail in stream locations would be limited to the In Water Work Period (ODFW 2008 or latest update). Project Design Criteria for aquatic species addresses crossings and trail approaches to crossings. These Design Criteria protect streams from sediment in puts during critical spawning for fish and breeding season for frogs.

Trails that slope into the inner gorge of the stream would have the potential to contribute sediment to the stream impacting approximately 1/8 mile of the channel and affecting fish and frog habitat used for breeding, spawning and rearing while the trail system is open in the, May 1-July 1 and October, during the higher precipitation months. However, Project Design Criteria for hardening approaches would minimize effects of sediment reaching streams.

Where project design criteria would not be effective is located in the narrative of each subwatershed in Alternative 2.

Redband trout and Columbia spotted frogs: Redband trout and Columbia spotted frogs would be affected at specific sites identified in the narrative of the effects analysis.

Project Design Criteria would minimize effects to aquatic species in designated stream crossings and trails except those identified in the narrative in the subwatersheds in Alternative 2 above. Where there are roads located within the sediment delivery zone of streams, timing of the opening of the trail, May 1, would cause sediment to deposit on spawning, and emergence areas for redband trout and breeding areas for Columbia spotted frogs.

If the Columbia spotted frog becomes proposed for listing or listed after the decision for this project is signed, conferencing or formal consultation with the U.S. Fish and Wildlife Service would be initiated.

In the short term (approximately 1 year through a high flow event), construction of culverts and runoff of construction of trails within RHCAs cause increase in sedimentation in streams that would fill pools. Reducing pools for fish, reduces hiding cover, resting and feeding areas and increases stream temperature. In the long term, when the rainy season returns in the fall and snow melt occurs in the spring, sedimentation from properly sized culverts should be set back to preproject. In the long term, when the rainy season returns in the fall and snow melt occurs in the spring, sedimentation from properly sized culverts should be set back to preproject. Having properly sized culverts for flow would reduce long term sediment into streams.

Construction of trails within the 300-foot sediment delivery zone would continue to deliver sediment into streams. In Class I and II streams, increased sediment would affect fish habitat by filling pools and increasing fine sediment,

When vegetation is removed from streambanks, water temperatures can be elevated as a result. Higher temperatures reduce the solubility of dissolved oxygen and decrease the oxygen carrying capacity of the water. These high temperatures increase metabolism, respiration, and oxygen demand of fish, frogs and other aquatic organisms (Kolbe and Luedke, 1993). Turbidity reduces the penetration of sunlight into the water that may affect the primary producers such as algae, phytoplankton, and other aquatic plants; thus potentially limiting photosynthetic activity, which many

organisms depend on for survival (Kolbe and Luedke, 1993). Suspended solids can settle over eggs and redds (fish nests) resulting in lower reproductive rates, and disrupts the food base filling the interstitial spaces between larger substrates such as gravel and cobble rendering this habitat as marginal at best for those macroinvertebrates which typically reside in these spaces. Bjornn, et. al. (1977) found that when the percentage of fine sediment exceeds 20% to 30% in spawning riffles, the survival and emergence of salmonid embryos begins to decline. The changes in the physical characteristics of streams and rivers can critically affect aquatic insects, fish, frogs and other animals that depend upon clear cold waters for habitat, spawning, or food (Havlick, 2002).

Benthic communities are macroinvertebrates, such as mayflies and damselflies, living in, or on the bottom, or attached to substrate on the bottom of aquatic systems and are frequently used to assess water quality (Evans 2001). These types of clean water macroinvertebrate species exhibit a range of responses to environmental stress. Evans (2001) found statistically significant effects from OHVs on benthic macroinvertebrates and water quality in pools. There were significant differences between disturbed versus non disturbed riffle areas at OHV crossings. Clean water macroinvertebrates are replaced with sediment tolerant macroinvertebrates as stream substrate increases in fine sediments. Clean water macroinvertebrates are preferred by redband trout as it takes less energy to consume and digest than sediment tolerant macroinvertebrates that are bigger in size.

As the Travel Management decision (2011) is implemented, off road travel will be restricted to designated routes as shown on the Motor Vehicle Use Maps (MVUM).

Existing sediment contributions from user created routes will continue to contribute sediment by erosion from trails fording streams, springs, and ponds and closed roads not properly maintained within RHCAs. These routes and crossings will not be maintained or decommissioned as a result of this EIS. They will be left to be self-maintained. Those routes with ruts created by OHV use will have a lowered water table. Replacement vegetation will change from meadow grasses to weeds. Crossings that have the potential for woody riparian species replacement, would expand unless in an area where livestock heavily browse riparian vegetation.

Alternative 1

Determination: Alternative 1 would have **No Impact** on redband trout or Columbia spotted frogs as there are no trails proposed.

Under the Travel Management decision, off-road travel will be restricted to designated routes as shown on the Motor Vehicle Use Maps (MVUM). However, user-created routes on closed or decommissioned roads within the 300-ft sediment delivery zone would likely continue to contribute sediment to streams, springs, and ponds. Routes with ruts lose their water table and meadow vegetation is replaced with weeds. Areas where revegetation can occur over time would take at least 15 years to recover; success would depend on browse by ungulates and the ability of uplands to restore.

Alternative 2

In Alternative 2, OHV trail is proposed in Deep Creek, Lower Beaver Creek, Upper North Fork Crooked River, and Upper Ochoco Creek watersheds. These projects would result in more effects to the streams and watersheds within the Ochoco Summit OHV Trail System project area as compared to Alternative 1, the no action alternative. Trail construction within the 300’ sediment delivery zone would increase sediment delivery into streams in the short term; however, in the long-term, sediment from construction would dissipate (see Hydrology section). Where trail is constructed within RHCAs at new sites on decommissioned roads or on roads that are proposed to be decommissioned due to sediment inputs affecting quality of aquatic species habitat, there may still be sediment issues.

Of the approximately 170 miles of proposed trail, about 14 miles of trail are in Class I, II, and III RHCAs and 4 miles of trail are in Class IV RHCAs. There are 31 crossings on Class I, II and III streams, and 76 crossings on Class IV streams. Alternative 2 has more miles and crossings in RHCAs than Alternative 3 and fewer crossings than Alternative 4.

In Alternative 2, 84% of the proposed trail is located in Deep Creek and Upper North Fork Crooked River watersheds. These two watersheds include Deep Creek that has watershed restoration (USDA 2009) in progress, and the Upper North Fork Crooked River where BAER restoration occurred as a result of the Maxwell Fire in 2006. The rest of the trail is in the Lower Beaver and Upper Ochoco Creek subwatersheds.

The trail will be open from May 1 to November 1 except on Paulina Ranger District, where trails would close at the beginning of the restriction period specified annually for the Rager Cooperative Travel Management Area, and would remain closed until May of each year. Crossings and stream approaches would be in accordance with the Project Design Criteria to reduce movement of the trail's surface during high precipitation months of May and October (USDA 2006). The trail would be open during critical spawning dates for fish that is from March to the end of June (Wydoski and Whitney 1979) and breeding season for frogs that varies from early March through the end of May. The timing of egg laying is largely a function of water temperature at the oviposition (laying and depositing eggs) site (Bull and Shepherd 2003), but other factors likely triggered movement of frogs to the oviposition site. Potential contributing factors could be photoperiod (daylight) or water temperature at overwintering sites.

Alternative 2 would have more impact on streambanks increasing sediment in streams, compared to the no action alternative, with increased stream crossings and potential disturbance during culvert or bridge installation. Based on design criteria for construction of culvert or bridge crossings, sedimentation would increase during the construction for approximately 1/8 mile downstream. Sedimentation volume would vary depending on the size of the culvert or the type of footings for bridges. Sedimentation would return to base after vegetation re-establishes and sediment distributes throughout the stream system taking approximately 5 days for initial sediment reduction. Reduction in sediment towards base levels would continue to occur as spring and fall rain events and snow melt occur. Areas that are currently entrenched (G and F-type channels) will continue to adjust and may take several decades to become stable with vegetation. Sediment yield from these entrenched systems would continue to exist, but would decline as streambanks adjust slope and become vegetated.

Sediment contribution would be at its greatest during trail and structure construction. Structures would be monitored after high flow events, which occur during the first fall/winter/spring after project completion (USDA 2008).

Lower Beaver Creek Watershed

North Wolf Creek Subwatershed: No new intermittent or perennial stream crossings would be added in the North Wolf Creek Subwatershed. In addition, all of the trails proposed within this subwatershed as part of Alternative 2 are Class III trails, designed for 24-inch wide motorcycle clearance, which would have much less disturbance and potential for capture of drainage as compared to the wider Class I and Class II trails.

Since the majority of the trails proposed in the North Wolf Subwatershed are located on existing roads and the new trails do not cross intermittent or perennial stream channels, this minor increase in road/trail densities across the subwatershed are not likely to increase the flow and sediment regime relative to the existing condition (see Hydrology section in Chapter 3 of this document). New trails proposed under Alternative 2 are not likely to measurably increase sediment delivery to streams.

After the user created routes and closed roads are no longer used by OHVs, it is estimated to take a minimum of 10 years to reestablish filtering vegetation. In areas where it is not a moist site, it is

estimated to take 15 or more years. Scab areas may not reestablish vegetation (Pers. comm, District Botanist 2010). In areas where roads are rutted and the water table has dropped, weeds will replace the vegetation removed from off road travel.

Upper North Fork Crooked River Watershed

Elliot Creek Subwatershed: The Maxwell Fire BAER rehabilitation road treatments, included rehabilitation work on segments of two roads within the Elliot Creek Subwatershed, FS 2200-505 and FS 2200-500. Culverts were removed and out sloped. Drain dips with outlets armored were constructed on FS 2200-500, 2200-550, and 2200-505 (tributary to Elliot Creek, Peterson subwatershed).

Approximately 0.04 miles of Class I trail would overlap FS 2200-500 where water bars were recommended for installation to enable roads to better handle expected surface runoff increases. Approximately 0.24 miles of Class I trail would overlap FS 2200-505, which crosses one intermittent and one perennial tributary to Elliot Creek and parallels the stream within the RHCA for almost the entire segment length. The crossing over the perennial tributary to Elliot Creek was undersized and was removed and replaced with rock ford as part of the Maxwell Fire BAER rehabilitation.

Approximately 2.0 miles of trail would be added within 300 feet of an intermittent stream, nine new stream crossings would be added, and 0.2 miles of trail are proposed that would intersect ground water dependent ecosystems or their RHCAs within the forest boundary portion of the subwatershed.

Based on design criteria for construction of culvert or bridge crossings, sedimentation would increase during the construction for approximately 1/8 mile downstream. Sedimentation volume would vary depending on the size of the culvert or the type of footings for bridges. The sedimentation would be at its greatest during construction. Structures would be monitored after high flow events, which occur during the first fall/winter/spring after project completion (USDA 2008). Sedimentation would return to base after vegetation re-establishes and sediment distributes throughout the stream system taking approximately 5 days for initial sediment reduction. Reduction in construction-related sediment toward base levels would continue as spring and fall rain events and snow melt occur. Class I vehicle trail on FS 2200-500 and FS 2200-505 within the high slope erosion hazard sediment delivery zone would contribute sediment to the adjacent stream. The trail opens May 1 and overlaps with redband spawning by 2 months for emergence and 1 month for breeding frogs.

Based on high Slope Erosion Hazard conditions at site-specific locations within the sediment delivery zone, .2 miles of the new trails proposed in Alternative 2 have the potential to increase sediment delivery to streams (see Hydrology section in Chapter 3 of this document). Increased sediment at these locations has the potential to reduce spawning success of redband trout and reproductive success of spotted frogs at these locations.

Howard Creek Subwatershed: Approximately 1.4 miles of trail would be added within 300 feet of an intermittent stream, four new stream crossings would be added, and 1.1 miles of trail are proposed that would intersect ground water dependent ecosystems or their RHCAs within the forest boundary portion of the subwatershed.

Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Howard Creek Subwatershed. Increases to the already high road/trail and stream crossing densities across the Howard Creek Subwatershed have the potential to increase peak flows and shorten response times relative to the existing condition.

Based on design criteria for construction of culvert or bridge crossings, sedimentation would increase during the construction for approximately 1/8 mile downstream. Sedimentation volume would vary depending on the size of the culvert or the type of footings for bridges. The sedimentation would be at its greatest during construction. Structures would be monitored after high flow events, which occur

during the first fall/winter/spring after project completion (USDA 2008). Sedimentation would return to base after vegetation re-establishes and sediment distributes throughout the stream system taking approximately 5 days for initial sediment reduction. Reduction in sediment toward base levels would continue as spring and fall rain events and snow melt occur. Based on increases in both road/trail densities within the sediment delivery zone and within and near ground water dependent ecosystems, Alternative 2 has the potential to increase sediment delivery to streams; however, bank stability is likely to be maintained (see Hydrology section in Chapter 3 of this document). Bank stability in surveyed streams in the Howard Creek Subwatershed is relatively good and met Forest Plan standards between 1994 and 2001. Sediment from a trail for Class I vehicles within the sediment delivery zone of adjacent streams would not be measurable. The trail would open annually on May 1, which would overlap redband spawning by 2 months and Columbia spotted frog breeding season by 1 month.

Peterson Creek Subwatershed: The headwaters of Peterson Creek contribute to the flow and habitat health of aquatic species throughout the stream. Primary headwater streams "nourish" downstream segments with essential supplies of water and food materials (both living organisms like insects and fish and decaying organic matter). Essential ecosystem services provided by headwater systems include attenuating floods, maintaining water supplies, preventing siltation of downstream rivers, maintaining water quality, and supporting biodiversity. Disruption of the hydrologic and biological processes of primary headwater streams takes a cumulative toll on the health of the whole river system (Ohio EPA 2003). Upper Petersen Creek has redband trout and Columbia spotted frogs.

Table 83 in the Hydrology section (Chapter 3 of this document) identifies two locations in the Peterson Creek subwatershed where there are specific hydrologic concerns: Forest Road 2200-550 and a proposed jeep boulder crawl.

The Maxwell Fire BAER rehabilitation road treatments included rehabilitation work on segments of Forest Road 2200-550. Approximately 0.18 miles of Class I trail would overlap FS 2200-550, which crosses Allen Creek, a fish-bearing perennial stream. The crossing structure was removed and banks were laid back as part of the Maxwell Fire BAER improvement projects. Based on design criteria, implementation of the Alternative 2 trail system would require installation of a culvert or bridge at this stream crossing location. The operational maintenance level of this road is Level I (Closed); however, the objective maintenance of this road is decommissioned, attributed to the potential for sedimentation into a high quality, fish-bearing perennial stream. Based on the BAER report for the Maxwell Fire, the vegetative recovery period was seven years, which would indicate hydrologic recovery should occur by the end of the summer of 2013. Field trips to the site during the summer of 2011 indicated that Allen Creek, in the vicinity of this stream crossing, was still in an unstable state and was still in the process of recovering from impacts from the Maxwell Fire. The purpose of operational maintenance level of FS2200-550 as decommissioned was to improve fish habitat, reduce excessive sediment and maintain and improve the high quality, fish-bearing perennial stream.

The proposed jeep boulder crawl area is located on two tributaries to Peterson Creek and traverses down steep terrain. There are two Class IV streams with five fords (three fords on one tributary and two on the other tributary) and located in the headwaters of Peterson Creek. A boulder crawl creates loosened soil that would flow downstream to Peterson Creek (Class I stream) during rain and snow melt events and during use of the jeep crawl; sediment from the two tributaries would convey additional sediment into the headwaters of Peterson Creek. Sediment would continue to flow downstream due to the existence of the trail. The campground loop road crosses Peterson tributary twice (north ½ of Sec. 32).

The proposed jeep crawl would intersect Class IV streams at the headwaters of Peterson Creek. A jeep crawl would be a chronic source of sediment that would flow into Peterson Creek during high water events. High amounts of sediments over base level would affect the quality of habitat and success of redband trout and Columbia spotted frogs that inhabit the creek.

Class I trail within the sediment delivery zone of streams could contribute sediment that may interfere with fish and frog reproductive success. The trail would open annually on May 1, which would overlap redband spawning by 2 months and Columbia spotted frog breeding season by 1 month.

Based on site specific sediment delivery and bank stability concerns, some trails proposed in the Peterson Creek subwatershed have the potential to increase sediment delivery to streams and unstable banks at site specific locations; implementation of Alternative 2 in these locations may potentially add to sediment and turbidity in Peterson Creek (Hydrology section). Design criteria are unlikely to prevent the increased sediment created from a jeep crawl crossing the class IV tributaries to the headwaters of Peterson Creek and the sediment that continues as a result of the Maxwell Fire (2006).

Porter Creek Subwatershed: Within the Porter Creek Subwatershed, approximately 0.26 miles of Class I trail and 17.7 miles of Class II trail located on existing National Forest System Road. Approximately 2.1 miles of Class I trail, 7.3 miles of Class II trail, and 0.04 miles of Class III new trail are proposed to be constructed as part of Alternative 2. No Class I trails are proposed to cross intermittent or perennial stream channels in Alternative 2. Class II trails are proposed to cross perennial and intermittent streams at 16 locations at an existing stream crossing on an existing road and at 7 new locations. No new trails are proposed that intersect GDEs or associated RHCAs.

Approximately 2.1 miles of trail would be added within 300 feet of an intermittent stream, seven new stream crossings would be added, and essentially no miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 2.1 miles of trail to the road/trail network within the sediment delivery zone of streams in the Porter Creek Subwatershed, the road/trail densities increase from 7.4 to 7.8 miles per square mile, both of these densities are high relative to the other Ochoco Summit project area Subwatersheds analyzed. Slope Erosion Hazard conditions for the Porter Creek Subwatershed are low overall, somewhat reducing the risk and magnitude of potential sediment delivery increases for the proposed trail network in Alternative 2.

No trails are proposed to cross Porter Creek on the reach of stream that is not meeting LRMP standards of no more than 20 percent unstable banks. Sediment input into Porter Creek and tributaries are not likely to be measurable or affect populations or habitat of aquatic species.

Deep Creek Watershed

Deep Creek, Little Summit Creek, Happy Camp Creek and Double Corral Creek are perennial streams that have been identified by Forest fish biologists and the Oregon Department of Fish and Wildlife to be critical refuges for redband trout. However, many of these systems have been impacted by past management and are not as effective as they once were in sustaining redband trout. In addition to redband trout, Columbia spotted frogs are present throughout the area.

Under Alternative 2, closed roads and user created-routes not used for the trail would be rehabilitated at their entry to prevent confusion of where the trail begins. Although the Travel Management Project ROD prohibits continued use of the user-created routes, the sections within the 300’ sediment delivery zone that would not be rehabilitated would continue to contribute sediment into streams well after trails are constructed. It is estimated that closed and decommissioned roads will take a minimum of 10 years to reestablish filtering vegetation, or 15 years or more on drier sites. Vegetation may not reestablish on scab areas (District Botanist 2010). In areas where roads are rutted and the water table has dropped, weeds are likely to replace native vegetation that was removed by off road travel.

Lower Deep Creek Subwatershed: Table 83 in the Hydrology section (Chapter 3 of this document) indicates that two proposed trail segments, totaling .8 miles, are located in areas of hydrologic concern. These segments would be located on Forest Roads 4200-600 and 4200-603.

The FS 4200-600 road parallels Big Spring Creek, a fish-bearing perennial stream, for approximately 0.3 miles and parallels an intermittent tributary to Big Spring Creek for approximately 0.4 miles. Approximately a third of the converted portion (0.3 mile) of the FS 4200-600 road is located on high slope erosion hazard, a third is located on moderate slope erosion hazard, and a third is located on low slope erosion hazard. Stream crossings would be constructed with both of these road segments. Field review (07/02/2012) by the hydrologist and fishery biologist observed portions of the decommissioned road were obliterated and would not be passable by Class I or II or vehicle traffic without significant construction. This section of road is less than 10 feet from an intermittent stream and approximately 25-50 feet from the stream in other areas. After crossing the intermittent stream, the new section of trail will cross Big Spring Creek, a perennial, fish bearing stream. Adjacent area has sedges, a wetland species. Disturbance level is in a location approximately 7 feet from an intermittent stream. There was little sign of sediment delivery. However, equipment for construction of the trail and the crossing would create disturbance and removal of vegetation that was reestablished as a result of the road closure. Trail width needed for Class I vehicles is greater than Class III vehicles and would contribute more continuous sediment in the areas of the sediment delivery zone.

Vegetation removed from construction equipment on closed and decommissioned roads to construct crossings and trail would continue sediment into streams during construction. It is estimated to take a minimum of 10 years to reestablish filtering vegetation. In areas where it is not a moist site, it is estimated to take 15 or more years. On scab areas, it may not reestablish its vegetation (District Botanist 2010). In areas where roads are rutted and the water table has dropped, weeds will replace the vegetation removed from off road travel.

Since erosion risk from ATV/OHV (Class I and II vehicles) trails has been shown to potentially equal that of a forest road network, it can be expected that trails have the potential to increase drainage densities and peak flows similar to forest roads (Meadows et al., 2008). Areas with high road densities, high drainage densities, and a high density of stream crossings typically result in higher connectivity of the road and stream network.

Establishing a Class I (OHV) trail on a decommissioned road that is a high sediment source to Big Spring Creek would increase fines in the substrate, potentially increasing sediment into the stream and reducing habitat for aquatic species where fish spawn and frogs breed. This portion of the trail would affect fish and frog habitat within the area and at least 1/8 mile downstream reducing potential spawning and breeding success.

The FS 4200-603 road parallels Buck Hollow, a perennial stream, for approximately 0.4 miles. The reopened portion of the FS 4200-603 road is located on high slope erosion hazard. Sediment delivery would increase in Buck Hollow and increase fines in the substrate of Buck Hollow Creek, which may affect spawning success.

Based on design criteria for construction of culvert or bridge crossings, sedimentation would increase during the construction for approximately 1/8 mile downstream. Sedimentation volume would vary depending on the size of the culvert or the type of footings for bridges. The sedimentation would be at its greatest during construction. Structures would be monitored after high flow events, which occur during the first fall/winter/spring after project completion (USDA 2008). Sedimentation would return to base after vegetation re-establishes and sediment distributes throughout the stream system taking approximately 5 days for initial sediment reduction. Reduction in sediment towards base levels would continue to occur as spring and fall rain events and snow melt occur as a result of completing crossings. Class I or Class II trails within the sediment delivery zone of streams with fish and frogs could contribute sediment to stream substrate, affecting areas where fish spawn and rear. The trail opens May 1 and overlaps with redband spawning by 2 months for emergence and 1 month for breeding frogs.

Jackson Creek Subwatershed: Within the Jackson Creek Subwatershed, approximately 9.3 miles of Class I trail, 2.4 miles of Class II trail, and 14.3 miles of Class III trail are located on existing Forest Service System Road. Approximately 5.4 miles of Class I trail, 0.32 miles of Class II trail, and 5.6 miles of Class III new trail are proposed to be constructed as part of Alternative 2. Alternative 2 proposes for Class I trails to cross perennial and intermittent streams with new trails at seven locations and to cross perennial and intermittent streams on existing roads at three locations. Class II trails are proposed to cross perennial and intermittent streams at no new locations and to cross perennial and intermittent streams at one location at an existing stream crossing on an existing Level II, high clearance road. Class III trails are proposed to cross perennial and intermittent streams at two new locations and to cross perennial and intermittent streams at ten locations at existing stream crossings on existing roads.

The Deep Creek Roads Analysis, Deep Creek Restoration Plan, and Deep Restoration Environmental Analysis identified change in operational maintenance for some roads. The following roads were proposed to be decommissioned in Jackson Creek Subwatershed proposed to be opened for construction of trail: FR1200-504, FR3000-802, FR3000-930, and FR4250-608.

Approximately 1.6 miles of trail will be added within 300 feet of an intermittent or perennial stream, nine new stream crossings will be added, and 0.7 miles of trail are proposed that intersect ground water dependent ecosystems or their RHCAs within the forest boundary portion of the subwatershed. The table above identifies the Class I and III trails proposed within the RHCA on the roads proposed for decommissioning.

Trail construction in high slope erosion hazard that parallels the stream such as on FS3000-930 could increase sedimentation into the stream affecting the quality of habitat for aquatic species. This would not meet the intent of the Deep restoration plan or INFISH. The other roads listed in the table above listed as low or moderate on the slope erosion hazard would not likely have measurable sediment with Class III trail construction and would meet INFISH and the intent.

Based on design criteria for construction of culvert or bridge crossings, sedimentation would increase during the construction for approximately 1/8 mile downstream. Sedimentation volume would vary depending on the size of the culvert or the type of footings for bridges. The sedimentation would be at its greatest during construction. Structures would be monitored after high flow events, which occur during the first fall/winter/spring after project completion (USDA 2008). Sedimentation would return to base after vegetation re-establishes and sediment distributes throughout the stream system taking approximately 5 days for initial sediment reduction. Reduction in sediment toward base levels would continue to occur as spring and fall rain events and snow melt occur. Class I or Class II trail on FS3000-930 within the sediment delivery zone of streams could contribute sediment that could affect areas where fish spawn and frogs breed. The trail opens May 1 and overlaps with redband spawning by 2 months for emergence and 1 month for breeding frogs.

Little Summit Prairie Creek Subwatershed: Within the Little Summit Prairie Creek Subwatershed, approximately 4.1 miles of Class I trail and 3.6 miles of Class III trail are located on existing Forest Service System Road. Approximately 1.2 miles of Class I trail and 5.8 miles of Class III new trail are proposed to be constructed as part of Alternative 2. Alternative 2 proposes for Class I trails to cross perennial and intermittent streams with new trail at one location and to cross a perennial or intermittent stream on an existing road at one location. Class III trails are proposed to cross perennial and intermittent streams at no new locations and to cross perennial and intermittent streams at two locations at existing stream crossings on existing roads.

Based on slight increases in both road/trail densities within the sediment delivery zone and in ground water dependent ecosystems, as well as overall moderate slope erosion hazard conditions, Alternative 2 proposed new trails have the potential to slightly increase sediment delivery to streams and ground water dependent ecosystems.

Based on design criteria for construction of culvert or bridge crossings, sedimentation would increase during the construction for approximately 1/8 mile downstream. Sedimentation volume would vary depending on the size of the culvert or the type of footings for bridges. The sedimentation would be at its greatest during construction. Structures would be monitored after high flow events, which occur during the first fall/winter/spring after project completion (USDA 2008). Sedimentation would return to base after vegetation re-establishes and sediment distributes throughout the stream system taking approximately 5 days for initial sediment reduction. Reduction in sediment toward base levels would continue to occur as spring and fall rain events and snow melt occur. The trail opens May 1 and overlaps with redband spawning by 2 months for emergence and 1 month for breeding frogs. With moderate slope erosion hazard conditions, sediment is not likely to be measurable.

Upper Ochoco Creek Watershed

Alternative 2 proposes approximately 12 miles of Class I trail and approximately 1.0 miles of Class III trail within the Upper Ochoco Creek Watershed. Approximately 5.0 miles of Class I trail are proposed on existing Forest Service System Roads. Approximately 6.9 miles of Class I trail and 1.0 mile of Class III trail would be new trails and not already part of the existing Forest Service System road network. Approximately 0.1 miles of new trail and 0.9 miles of trail on existing roads in the Upper Ochoco Creek Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. A total of four existing intermittent and perennial stream crossings are proposed for use.

Upper Marks Creek Subwatershed: Within the Upper Marks Creek Subwatershed, approximately 4.5 miles of Class I trail are located on existing Forest Service System Road. Approximately 5.0 miles of Class I trail and 0.3 miles of Class III new trail are proposed to be constructed as part of Alternative 2. Alternative 2 proposes for Class I trails to cross perennial and intermittent streams on existing roads at four locations. Class III trails are not proposed to cross perennial and intermittent streams at new or existing locations.

Based on a negligible increase in the road/trail density within the sediment delivery zone, a slight increase in the road density in ground water dependent ecosystems, no new stream crossings, as well as overall moderate Slope Erosion Hazard Conditions, Alternative 2 proposed new trails are not likely to measurably increase sediment delivery to streams in this subwatershed.

Table 87. Summary of Effects of Alternative 2 to Aquatic Habitats.

Impacts and Measures	Alternative 2	Effects
Impact to fish & frog habitat at and below stream crossings	Miles of trail over Class I, II, and III = 13.75 miles in RHCAs. The rest of the routes and closed roads used by OHVs would not be restored but would be self maintained; roads in RHCAs continue to input sediment into streams, potentially reducing habitat available to aquatic species for a minimum of 10 years (15 or more in wet sites); design criteria would reduce sediment movement on stream crossing approaches by constructing hardened approaches to stream crossings with structures such as concrete blocks to minimize movement of the trail surface at crossings and sediment entering streams during rain events.	Areas of concern for aquatic species (see narrative): *Peterson Cr*, Class I stream: jeep boulder crawl in headwaters crosses 5 class IV streams; sediment washes into headwaters Peterson Cr. increasing sediment potentially reducing habitat available to aquatic species; habitat available to aquatic species. *Deep Cr* 0.7 mi of 4200-600 was decommissioned that parallels the stream within the RHCA ; segment located approx. 100 ft from the stream proposed to be reopened as Class I trails opening road segment that was closed because of sediment impacts to high valued fisheries would potentially reduce habitat available to aquatic species. *Elliot Cr:* The 0.2 mile of trail within the high slope erosion portion of the trail and located within sediment delivery zone has the potential for sediment in put into the stream. Increased sediment would affect fish and frog habitat by reducing potential population success. This section of trail does not meet the intent of INFISH for sediment inputs within a high value fishery and frog habitat at this site.
Reduce effectiveness of restoration in Deep, Crazy, Little Summit, Allen Creeks subwatersheds	Culverts were pulled and roads closed (with management objective to decommission) because of sediment issues and impacts to high quality aquatic species would be reopened for the OHV trail (see p. 21-28) (Maxwell Fire 2006); would not promote an upward trend as a result of restoration; Deep has decommissioned roads proposed to be turned into the trail; portions are 100 ft from the stream would not promote an upward trend. Using roads for trails that are proposed for decommissioning and closure because of affects to aquatic habitat do not meet the intent of the improving aquatic habitat for a high valued fishery.	See Deep Creek Watershed and Upper North Fork Crooked River Watershed narrative. The Travel Rule makes user created routes and closed and decommissioned road beds no longer available for off road use. These routes will not be maintained, seeded or drainage provided for their improvement; they are considered self maintained. Rutted routes from use are likely to be established with weeds.

Table 87. Summary of Effects of Alternative 2 to Aquatic Habitats.

Impacts and Measures	Alternative 2	Effects
Impacts to streambanks	Based on design criteria for construction of culvert or bridge crossings, sedimentation would increase during the construction for approximately 1/8 mile downstream. Sedimentation volume would vary depending on the size of the culvert or the type of footings for bridges. The sedimentation would be at its greatest during construction. At site specific locations by converting a closed road, with an objective maintenance of decommissioned, to Class I trail that crosses Allen Creek in an unstable portion of the stream and by adding two miles of Class II (jeep crawl) trail on a High Slope Erosion Hazard slope near Peterson Creek, and jeep crawl in headwaters in Peterson Creek; site specific locations may experience higher incidents of unstable banks and sediment delivery	Increased sediment may decrease habitat effectiveness and reproductive success for fish and frogs at some locations.
Delivery of upland soil to riparian areas	See Design Features (Chapter 2).	Generally, design features (Chapter 2) would reduce rutting potential and road surface materials transporting into streams during the wet season, mid-October to mid-June (BAER 2006) or during rain events throughout the summer season provided there is sufficient vegetation on the margins of the trail. Sediment and contaminants could increase at jeep crawl/trail sites.
Miles of trail in Deep Cr Watershed and Upper North Fork Crooked River Watershed	Deep Cr Watershed: 66 mi. Upper North Fork Crooked River Watershed: 78 mi.	Of 170 miles of trail proposed, 85% of the trail are in these 2 watersheds that include Jackson, Little Summit Prairie, and Lower Deep creek subwatersheds (Deep Cr Watershed); and Elliot (includes Allen and East Fork Allen creeks), Howard, Peterson, and Porter creek subwatersheds (Upper North Fork Crooked River). These 2 watersheds are considered sensitive aquatic habitat areas and have the majority of the proposed trail in Alternative 2.
Trail over stream crossings by stream class	Class 1: 7 Class 2: 20 Class 3: 4 Class 4: 76	Project Design Criteria would minimize sediment flowing into streams from the trail crossing except on the jeep crawl with five ford crossings in Headwaters of Peterson Creek. PDCs cannot eliminate sedimentation that would continue downstream into redband and frog habitat.
Miles of trail in anadromous watershed-Rock & Bridge Creeks	0.89 mi. trail; no sediment could reach stream channels; miles of unmanaged routes that would not be maintained unknown; no effect to anadromous fish or their habitat	Anadromous watersheds in the project area do not have trails that are within the sediment delivery zone that would impact aquatic species or their habitat. Consultation is not needed.

Table 87. Summary of Effects of Alternative 2 to Aquatic Habitats.

Impacts and Measures	Alternative 2	Effects
Trail in RHCAs by 6th HUC (within 300 feet of the sediment delivery zone)	Deep Creek Watershed: 36 mi. • Jackson Cr Subwatershed 10.1mi • Little Summit Prairie Sub 2.3 • Lower Deep Cr Sub 3.9 Upper North Fork Crooked River Watershed: 24.6 mi • Elliott Cr Subwatershed 5.6 mi • Howard Creek Sub 2.3 • Peterson Creek Sub 4.9 • Porter Creek Sub 11.8 Upper Ochoco Creek 1.0 mi • Upper Marks Creek 1.0 mi Lower Beaver Creek: 1.2 mi North Wolf Creek 1.2 mi	See Table 83 for specific locations with hydrologic concerns.

Alternative 3

In Alternative 3, the OHV trail is proposed in Deep Creek, Lower Beaver Creek, Upper North Fork Crooked River, and Upper Ochoco Creek watersheds.

Alternative 3 provides motorized trails and areas at a lesser scale to reduce potential for impacts to water quality, fish and wildlife, and to reduce conflict between motorized and non-motorized recreational use.

Approximately 101 miles of trail are proposed that include approximately 6 miles of trail in Class I, II, and III RHCAs and 1 mile of trail in Class IV RHCAs. There are 21 crossings on Class I, II and III streams, and 34 crossings on Class IV streams. Alternative 3 has fewer crossings than Alternatives 2 and 4.

Of the 101 miles of trail, approximately 88 miles of trail are on closed roads, those that have been decommissioned, or new routes. Approximately 13 miles of trail would be on existing open roads.

Lower Beaver Creek Watershed

Alternative 3 proposes 9.1 miles of trail on closed roads, decommissioned roads, and new routes. Approximately 0.28 mile of trail is proposed on open roads. There are 3 crossings on Class IV streams. Approximately 0.2 miles of new trail and 1.0 miles of trail on existing roads in the Lower Beaver Creek Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. A total of three existing stream crossings are proposed for use, all of which cross intermittent streams. Project design criteria would minimize possible effects to aquatic species and their habitat.

North Wolf Creek Subwatershed: North Wolf Creek has 3 crossings on Class IV streams. Within the North Wolf Creek Subwatershed, approximately 9 miles of new trail are proposed to be constructed on closed roads, decommissioned roads and new routes. There are no crossings on Class I, II, or III streams.

Within the North Wolf Creek Subwatershed, approximately 3.2 miles of existing Forest Service System Road, mostly closed roads, and approximately 1.2 miles of new trail are proposed to be constructed as part of Alternative 3. The 1.2 miles of new trail are predominately along ridges and in areas not adjacent to stream channels.

Since the majority of the trails proposed in the North Wolf Subwatershed are located on existing roads and the new trails do not cross intermittent or perennial stream channels, this minor increase in road/trail densities across the subwatershed are not likely to increase the flow and sediment regime relative to the existing condition (see "Hydrology" section in Chapter 3 of this document).

Approximately 0.2 miles of trail will be added within the sediment delivery zone; 300 feet of an intermittent stream and no new stream crossings will be added. Slope Erosion Hazard Ratings are relatively high; however, by not adding any new intermittent or perennial stream crossings and only minimal trail length near streams in the North Wolf Creek Subwatershed, the additional erosion potential from the 0.2 additional miles of trail is not expected to measurably increase sediment delivery to the streams or stream turbidity in the North Wolf Creek Subwatershed (see "Hydrology" section in Chapter 3 of this document). Sediment is not likely to be measurable to affect aquatic species.

Following the project design criteria, there would be minimal effects to aquatic species or their habitat.

Upper North Fork Crooked River

Alternative 3 proposes approximately 15 miles of Class I trail and approximately 8.0 miles of Class III trail within the Upper North Fork Crooked River Watershed. Approximately 5.3 miles of Class I trail and 4.9 miles of Class III trail are proposed on existing National Forest System roads. Approximately 9.5 miles of Class I trail and 3.1 miles of Class III trail would be new trails not already part of the existing Forest Service System road network. Approximately 2.8 miles of new trail and 2.1 miles of trail on existing roads in the Upper North Fork Crooked River Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. A total of 13 new and 3 existing intermittent and perennial stream crossings are proposed for use.

Peterson Creek Subwatershed: There are no trail proposals in Alternative 3 for Peterson Creek Subwatershed. There are trails in this subwatershed in Alternatives 2 and 4.

Howard Creek Subwatershed: Within the Howard Creek Subwatershed, approximately 1.6 miles of Class I trail are located on existing Forest Service System Road and approximately 6.2 miles of new Class I trail are proposed to be constructed as part of Alternative 3. Alternative 3 proposes for Class I trail to cross perennial and intermittent streams with new trails at four locations.

Approximately 1.4 miles of trail will be added within 300 feet of an intermittent stream, four new stream crossings will be added, and 0.8 miles of trail are proposed that intersect ground water dependent ecosystems or their RHCAs within the forest boundary portion of the subwatershed ("Hydrology" section in Chapter 3 of this document).

Based on increases in both road/trail densities within the sediment delivery zone and within and near ground water dependent ecosystems, Alternative 3 proposed new trails in Howard Creek Subwatershed have the potential to increase sediment delivery to streams; however, is not likely to be measurable to affect aquatic species. Approximately 1.4 miles of trail will be added within

300 feet of an intermittent stream, four new stream crossings will be added, and 0.8 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. By adding approximately 1.4 miles of trail to the road/trail network within the sediment delivery zone of streams in the Howard Creek Subwatershed, the road/trail densities increase from 8.2 to 8.6 miles per square mile, both of these densities are high relative to the other Ochoco Summit Planning Area Subwatersheds analyzed. The addition of 0.8 miles of trail within GDEs and associated RHCAs raises road densities in GDEs from approximately 6.9 to 7.2 miles per square mile, bringing the overall rating up from moderate to high relative to the other subwatersheds. By following the Project Design Criteria, sediment delivery should be relatively low relative to the no action alternative.

Elliot Creek Subwatershed: Within the Elliot Creek Subwatershed, approximately 3.7 miles of Class I trail are located on existing Forest Service System Road and approximately 3.3 miles of Class I new trail are proposed to be constructed as part of Alternative 3. Alternative 3 proposes for Class I trails to cross perennial and intermittent streams at one location at an existing stream crossing on existing roads and to cross perennial and intermittent streams with new trails at four locations. Indian Creek (Class II stream) and tributaries and Crosswhite Creek (Class IV stream) have crossings.

The Maxwell Fire BAER rehabilitation road treatments, included rehabilitation work on segments of two roads within the Elliot Creek Subwatershed, FS 2200-505 and FS 2200-500. In Alternative 3, proposed trail locations do not overlap either FS 2200-500 or FS 2200-505.

Overall, slope erosion hazard conditions are high in the vicinity of streams in the Elliot Creek Subwatershed, which can make interconnectivity of roads and streams more likely, potentially resulting in increased peak flows in streams. Streams with trail include Indian Creek and Crosswhite Creek. Increases in the road/trail and stream crossing densities across the Elliot Creek Subwatershed, in combination with poor slope erosion hazard conditions, potentially increases the flow and sediment regime relative to the existing condition. Sediment delivery estimates for this project indicate an addition of a relatively moderate amount of sediment delivery relative to the no action alternative.

Approximately 0.8 miles of trail will be added within 300 feet of an intermittent stream, four new stream crossings will be added, and 0.2 miles of trail are proposed that intersect groundwater dependent ecosystem or their RHCAs within the forest boundary portion of the subwatershed.

Project design criteria would be followed for stream crossings; therefore, sediment is likely to not be measurable in Indian Creek. Crosswhite Creek has a stream crossing and trail within the RHCA. If the trail location is beyond 50 feet of Crosswhite Creek, sediment delivery would not be measurable to affect aquatic species.

Porter Creek Subwatershed: Within the Porter Creek Subwatershed, approximately 4.9 miles of Class III trail is located on existing Forest Service System Road. Approximately 3.1 miles of Class III new trail are proposed to be constructed as part of Alternative 3. No Class I or II trails are proposed to cross intermittent or perennial stream channels in Alternative 3. Class III trails are proposed to cross perennial and intermittent streams at five new locations. Approximately 0.6 miles of trail will be added within 300 feet of an intermittent stream, five new stream crossings will be added.. By adding approximately 0.6 miles of trail to the road/trail network within the sediment delivery zone of streams in the Porter Creek Subwatershed, the road/trail densities increase from 7.4 to 7.5 miles per square mile, both of these densities are high relative to the other Ochoco Summit project area Subwatersheds analyzed. Slope Erosion Hazard conditions for the Porter Creek Subwatershed are low overall, somewhat reducing the risk and magnitude of potential sediment delivery increases for the proposed trail network in Alternative 3. Sediment delivery estimates for this project indicate an addition of a relatively moderate amount of

sediment delivery to the no action alternative. Proposed new trails have the potential to increase sediment delivery to streams but not likely to be measurable to affect aquatic species.

Deep Creek Watershed

Alternative 3 proposes approximately 43 miles of Class III trails (motorcycles) within the Deep Creek Watershed. Approximately 24 miles of Class III trails are proposed on existing Forest Service System Roads. Approximately 19 miles of Class III trails would be new trails and not already part of the existing Forest Service System road network. Approximately 2.6 miles of new trail and 7.0 miles of trail on existing roads in the Deep Creek Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. A total of 11 new and 13 existing intermittent and perennial stream crossings are proposed for use. Relative to Alternative 2, Alternative 3 eliminates all Class I (ATV) trails and converts most of them to Class III trails.

Lower Deep Creek Subwatershed: Based on site specific sediment delivery and bank stability concerns, Alternative 3 proposed trails have the potential to increase sediment delivery to streams overall and unstable banks at site specific locations, which would potentially add to sediment and turbidity increases in Deep Creek.

Proposed restoration projects were identified in the Deep Creek Restoration Plan, some of which have already been implemented. The purpose of the Deep Creek Restoration Plan was to improve overall stream and riparian health and integrity within the watershed and improve water quality and associated habitat suitable for use by redband trout and other aquatic life. Other roads that are proposed to be decommissioned are FR1200-504, FR3000-802, FR3000-930, FR4250-608 (Jackson), FR4270-508 (Little Summit Prairie). These roads are not proposed in Alternatives 3 but are proposed for trail in Alternatives 2 and 4.

Of the 2.8 miles of road within the sediment delivery zone of streams that were decommissioned in the Lower Deep Creek Subwatershed as part of the Deep Creek Restoration Plan, 0.7 mile of the FS 4200-600 and 0.4 mile of the FS 4200-603 proposed on decommissioned roads are planned to be converted to Class III trails in Alternative 3.

The FS 4200-600 road parallels Big Spring Creek, a fish-bearing perennial stream, for approximately 0.3 miles and parallels an intermittent tributary to Big Spring Creek for approximately 0.4 miles. Approximately a third of the converted portion (0.3 mile) of the FS 4200-600 road is located on high slope erosion hazard, a third is located on moderate slope erosion hazard, and a third is located on low slope erosion hazard. Stream crossings would be constructed with both of these road segments. Field review (07/02/2012) by the hydrologist and fishery biologist observed portions of the decommissioned road were obliterated and would not be passable by motorcycle or vehicle traffic without significant construction. This section of road is less than 10 feet from an intermittent stream and approximately 25-50 feet from the stream in other areas. After crossing the intermittent stream, the new section of trail will cross Big Spring Creek, a perennial, fish bearing stream. Adjacent area has sedges, a wetland species. Disturbance level is in a location approximately 7 feet from an intermittent stream. There was little sign of sediment delivery. However, equipment for construction of the trail and the crossing would create disturbance and removal of vegetation that was reestablished as a result of the road closure. It is estimated to take a minimum of 10 years to reestablish filtering vegetation (pers. comm., District botanist). In areas where it is not a moist site, it is estimated to take 15 or more years. On scab areas, it may not reestablish its vegetation (District Botanist 2010). In areas where roads are rutted and the water table has dropped, weeds will replace the vegetation removed from off road travel.

Based on design criteria, implementation of the Alternative 3 trail system would require construction of a culvert or bridge at these stream crossing locations.

Accessing well vegetated closed roads by equipment to construct trail and crossings would add sediment until vegetation re-establishes on disturbed sites. It is estimated to take a minimum of 10 years to reestablish filtering vegetation. In dry sites, it is estimated to take 15 or more years; scab areas may not reestablish vegetation (pers. comm., District botanist). Until vegetation is reestablished, fine sediments would continue to be introduced into the substrate of Big Spring Creek, which can affect fish habitat.

The FS 4200-603 road parallels Buck Hollow, a perennial stream, for approximately 0.4 miles. The reopened portion of the FS 4200-603 road is located on high slope erosion hazard. There is an unmapped intermittent stream that FS4200-603 parallels prior to reaching the main channel and exclosure. After the road/trail crosses the main intermittent channel, it comes within 10 feet from the main intermittent channel. The road is relatively flat but highly erosive; the buffer is not well vegetated. The stream was dry through the exclosure, above and below. There is little sign of direct sediment delivery. Trail construction that parallels Buck Hollow Creek has the potential to affect habitat for fish and frogs.

Based on design criteria for construction of culvert or bridge crossings, sedimentation would increase during the construction for approximately 1/8 mile downstream. Sedimentation volume would vary depending on the size of the culvert or the type of footings for bridges. The sedimentation would be at its greatest during construction. Structures would be monitored after high flow events, which occur during the first fall/winter/spring after project completion (USDA 2008). Sedimentation would return to base after vegetation re-establishes and sediment distributes throughout the stream system taking approximately 5 days for initial sediment reduction. Reduction in sediment would continue to occur as spring and fall rain events and snow melt occur.

***Little Summit Prairie Creek*:** Within the Little Summit Prairie Creek Subwatershed, approximately 5.6 miles of Class III trail are located on existing Forest Service System Road. Approximately 7.0 miles of Class III new trail are proposed to be constructed. Class III trails are proposed to cross 1 Class I stream and 2 Class IV streams.

Based on design criteria for construction of culvert or bridge crossings, sedimentation would increase during the construction for approximately 1/8 mile downstream. Sedimentation volume would vary depending on the size of the culvert or the type of footings for bridges. The sedimentation would be at its greatest during construction. Structures would be monitored after high flow events, which occur during the first fall/winter/spring after project completion (USDA 2008). Sedimentation would return to base after vegetation re-establishes and sediment distributes throughout the stream system taking approximately 5 days for initial sediment reduction. Reduction in sediment would continue to occur as spring and fall rain events and snow melt occur.

Approximately 0.6 miles of trail will be added within 300 feet of an intermittent or perennial stream, one new stream crossing will be added, and 0.4 miles of trail are proposed that intersect groundwater dependent ecosystems or their RHCAs within the forest boundary portion of the subwatershed (“Hydrology” section in Chapter 3 of this document). Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Little Summit Prairie Creek Subwatershed. Estimates of sediment delivery indicate that Alternative 3 has the potential to add a low amount of sediment delivery relative to the no action alternative (Alternative 1) and would not likely measurably affect aquatic species.

Jackson Creek Subwatershed: Within the Jackson Creek Subwatershed, approximately 15 miles of Class III trails are proposed for closed roads, decommissioned roads and new routes. Approximately 4 miles of trail is proposed for existing open roads. Crossings are on 2 Class I streams, 3 crossings on Class II streams and 7 crossings on Class IV streams.

Based on design criteria for construction of culvert or bridge crossings, sedimentation would increase during the construction for approximately 1/8 mile downstream. Sedimentation volume would vary depending on the size of the culvert or the type of footings for bridges. The sedimentation would be at its greatest during construction. Structures would be monitored after high flow events, which occur during the first fall/winter/spring after project completion (USDA 2008). Sedimentation would return to base after vegetation re-establishes and sediment distributes throughout the stream system taking approximately 5 days for initial sediment reduction. Reduction in sediment would continue to occur as spring and fall rain events and snow melt occur.

FS 3000-930 was not located in the field (07/02/2012). After aerial photo review of the area, it appears the road has vegetated buffer to Double Corral Creek. The first section of road after crossing Double Corral Creek is relatively steep and a short section appeared to be delivering sediment to Double Corral Creek. Trail approach to the stream crossing would follow design criteria with hardened sites to avoid movement of soil/sediment into stream channels. Constructing the trail and the crossing on Double Corral Creek would remove vegetation on the well-vegetated road from staging equipment for the construction project. Sediment would be contributed to the stream until the vegetation is reestablished after construction impacts; it is estimated to take a minimum of 10 years for self-seeded filtering vegetation to reestablish. In areas where it is not a moist site, it is estimated to take 15 or more years. On scab areas, it may not reestablish its vegetation (District Botanist 2010). In areas where roads are rutted and the water table has dropped, weeds will replace the vegetation removed from off road travel.

Approximately 0.9 mile of trail will be added within 300 feet of an intermittent or perennial stream, six new stream crossings will be added, and 0.4 miles of trail are proposed that intersect ground water dependent ecosystems or their RHCAs within the forest boundary portion of the subwatershed. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Jackson Creek Subwatershed. Estimates of sediment delivery indicate that Alternative 3 has the potential to add a moderate amount of sediment delivery relative to the no action alternative (Alternative 1), but less than Alternatives 2 and 4. Design criteria proposed for trail construction will reduce effects of sediment to the stream over user created routes that do not have proper drainage. However, sediment increases would occur along trail within the 300-foot sediment delivery zone of fish bearing streams.

Based on slight increases in both stream crossing and road/trail densities within the sediment delivery zone and in ground water dependent ecosystems, as well as overall moderate Slope Erosion Hazard Conditions, Alternative 3 proposed new trails have the potential to moderately increase sediment delivery to streams and ground dependent ecosystems; however, is not likely to be measurable to affect aquatic species.

Upper Ochoco Creek Watershed

Alternative 3 proposes approximately 24 miles of Class I trail within the Upper Ochoco Creek Watershed. Approximately 11 miles of Class I trail are proposed on existing Forest Service System Roads. Approximately 12 miles of Class I trail would be new trails and not already part of the existing Forest Service System road network. Approximately 1.1 miles of new trail and 1.7 miles of trail on existing roads in the Upper Ochoco Creek Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. A total of six existing intermittent and perennial stream crossings and six new stream crossings are proposed for use.

Parking and staging areas are not proposed in the Ahalt Creek area as in Alternative 2. No trail is proposed in Ochoco Creek. For the western portion of the proposed trail area, there is a crossing on Nature Creek, and two on Crystal Creek, both Class II streams. Rush Creek, a Class IV stream, has a crossing. Upper Ochoco Creek has 3 crossings on Class II streams, 3 crossings on Class III streams and 6 crossings on Class IV streams. Design criteria would minimize sedimentation that would be measurable at stream crossings.

***Upper Marks Creek Subwatershed*:** Alternative 3 proposes for Class I trail to cross 3 Class II streams and 3 Class IV streams on 20 miles of closed roads, decommissioned roads and new routes with 2 miles on open roads.

Based on increased road/trail densities, stream crossing densities, road/trail densities in the vicinity of streams and ground water dependent ecosystems, and channel type conditions in the Upper Marks Creek Subwatershed, Alternative 3 proposed trails have the potential to increase sediment delivery to streams and unstable banks, which would potentially add to sediment and turbidity increases in Marks Creek ("Hydrology" section in Chapter 3 of this document).

Approximately 1.1 miles of trail will be added within 300 feet of an intermittent or perennial stream, six new stream crossings will be added, and 1.4 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed.

Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Upper Marks Creek Subwatershed. Estimates of sediment delivery indicate that Alternative 3 has the potential to add a relatively moderate amount of sediment delivery relative to the no action alternative (Alternative 1) and Alternative 2, but less than Alternative 4. Based on increases in stream crossing densities and road densities in groundwater dependent ecosystems and near streams, as well as sediment delivery estimates, sediment delivery effects are expected to be moderate in Alternative 3 for the Upper Marks Creek Subwatershed.

Estimates of sediment delivery indicate that Alternative 3 has the potential to add a relatively moderate amount of sediment delivery relative to the no action alternative (Alternative 1). Based on increases in stream crossing densities and road densities in groundwater dependent ecosystems and near streams, as well as sediment delivery estimates, sediment delivery effects are expected to be moderate in Alternative 3 for the Upper Marks Creek Subwatershed. Sediment is not likely to be measurable to affect aquatic species.

Duncan Creek Subwatershed: There are no stream crossings in the Duncan Creek Subwatershed in Alternative 3. There is 0.12 mile of trail on closed and new routes. There would not be any effects to aquatic species or their habitat.

Headwaters Ochoco Creek Subwatershed: There are no stream crossings in the Headwaters Ochoco Creek Subwatershed in Alternative 3. There is 1 mile of trail on new routes and 0.18 mile of trail on existing open roads. There would not be any effects to aquatic species or their habitat.

Table 88 is a summary of the impacts and measures for Alternative 3.

Table 88. Alternative 3 impacts and measures.

Impacts and Measures	Alternative 3	Effects
Impact to fish & frog habitat at and below stream crossings	Miles of trail over Class I, II, and III = 5.98 miles in RHCAs. As the travel rule is enforced, unmanaged OHV travel continues to reduce; user created routes only restored where confusion may occur at trail opening; the rest of the routes and closed roads used by OHVs would not be restored or maintained; roads in RHCAs continue to input sediment into streams with potential for filling pools reducing habitat available to aquatic species; until user created routes are revegetated (approximately 15 years or longer) dependent on ruts, downcuts, and loss of water table; design criteria would reduce sediment movement on stream crossing approaches by constructing hardened approaches to stream crossings with structure such as concrete blocks to minimize movement of the trail surface at crossings and sediment entering streams during rain events. Areas of concern for aquatic species (see narrative): *Deep Cr* 0.7 mi of 4200-600 was decommissioned that parallels the stream within the RHCA; proposed to be reopened that were closed because of sediment impacts to high valued fisheries would impact fish and frog habitat and species. Unmanaged OHV travel until Travel Rule is enforced would impact streams with use of closed and decommissioned roads that were closed because of previous sedimentation issues.	*Deep Cr:* Approximately a third of the converted portion (0.3 mile) of the FS 4200-600 road would be located on high slope erosion hazard, and would contribute sediment during the 10-15 years before filtering vegetation is restored. The FS 4200-603 road parallels Buck Hollow Creek, a perennial stream, for approximately 0.4 miles. The reopened portion of the FS 4200-603 road is located on high slope erosion hazard. There is an unmapped intermittent stream that FS4200-603 parallels prior to reaching the main channel and exclosure. The road is relatively flat but highly erosive; the buffer is not well vegetated. This area has the potential to effect to fish or frogs in the portion of the trail that parallels Buck Hollow Creek.
Reduce effectiveness of restoration in Deep, Crazy, Little Summit, Elliot subwatersheds	Deep Creek has decommissioned roads proposed to be turned into the trail; portions are 100 ft from the stream (see comment above); would not promote an upward trend. Using roads for trails that are proposed for decommissioning and closure because of affects to aquatic habitat do not meet the intent of the Deep restoration plan and would not meet INFISH in the section of trail along Big Springs Creek in the high slope erosion area and would increase the sediment (see comment in next column)	The FS 4200-603 road parallels Buck Hollow Creek, a perennial stream, for approximately 0.4 miles. The reopened portion of the FS 4200-603 road is located on high slope erosion hazard. This area has the potential to effect to fish or frogs in the portion of the trail that parallels Buck Hollow Creek.
Impacts to streambanks	Culverts and bridges will be used for Class I, and II streams, and Class III streams where it flows into Class I or II (determined individually) (no fords) except where mixed use roads are used for both highway + non highway legal vehicles; impacts would continue from OHV use until the Travel Rule is enforced; culverts would increase sediment from construction below bankful of streams and existing undersized culverts used on trail. High sediment during construction and reduced within 5 days after completion.	New trail crossing will increase sedimentation during construction that will be culverts or bridges and likely dissipate after winter and spring rain/snow events. Streambanks at these sites will alter and will reduce any woody species within the construction sites.

Table 88. Alternative 3 impacts and measures.

Impacts and Measures	Alternative 3	Effects
Delivery of upland soil to riparian areas	Out slope and harden approaches to streams using materials such as concrete blocks that do not allow movement of soil or gravels or erosion or similar design that strengthens unstable surfaces would reduce sedimentation into streams. Hardening would occur where the trail enters and exits the stream crossing to a gradient break for no more than 100 feet. At this point, construct rolling dips of such size that it would not need maintenance. If the trail continues up hill, continue constructing the rolling dips approximately every 50 feet or where there is a break in grade to prevent channelizing sediment into streams especially during snow melt, rain events, or rain-on-snow events. This will reduce rutting potential and road surface materials transporting into streams during the wet season, mid-October to mid-June (BAER 2006) or during rain events throughout the summer season provided there is sufficient vegetation on the margins of the trail. On unmanaged (no maintenance) OHV routes, upland soils from roads leading to streams where approaches are steep leading to crossings, carry sediment and contaminants to streams in ruts could flow into streams. Created routes remain on the landscape and are not maintained as a result of this project. On managed trails contaminants could increase especially at approaches to crossings. Most created routes would revegetate in 15 years or longer dependent on ruts in roads, loss of water table.	Generally, design features (Chapter 2) would reduce rutting potential and road surface materials transporting into streams during the wet season, mid-October to mid-June (BAER 2006) or during rain events throughout the summer season provided there is sufficient vegetation on the margins of the trail.
Miles of trail in Deep Cr Watershed and Upper North Fork Crooked River Watershed	Deep Cr Watershed: 43 mi. Upper North Fork Crooked River Watershed: 23 mi.	
Trail over stream crossings by stream class	Class 1: 4 Class 2: 12 Class 3: 5 Class 4: 34	
Miles of trail in anadromous watershed-Rock & Bridge creeks	0.89 mi. trail; no sediment could reach stream channels; miles of unmanaged routes that would not be maintained unknown; no effect to anadromous fish or their habitat for proposed trails in the action alternatives	Anadromous watersheds in the project area do not have trails that are within the sediment delivery zone that would impact aquatic species or their habitat. Consultation is not needed.
Trail in RHCAs by 6th HUC (within 300 feet of the sediment delivery zone)	Deep Creek Watershed: 9.6 mi. • Jackson Cr Subwatershed 4.9 mi • Little Summit Prairie Sub 1.2 mi • Lower Deep Cr Sub 3.5 mi Upper North Fork Crooked River Watershed: 4.9 mi • Elliot Cr Subwatershed 1.3 mi • Howard Creek Sub 2.2 mi • Peterson Creek Sub 0 mi • Porter Creek Sub 2.0 mi Upper Ochoco Creek 2.7 mi • Upper Marks Creek 2.7 mi Lower Beaver Creek: 1.3 mi • North Wolf Creek 1.3 mi	See Table 83 for specific locations with hydrologic concerns.

Alternative 4

In the short-term with the implementation of Alternative 4, sediment delivery would increase; in the long-term, even though some user-created trails have revegetated, due to the extensive network of OHV trails added in this alternative, impacts to the flow and sediment regime and sediment/turbidity levels in the streams would likely remain at or in excess of the existing condition. Alternative 4 would result in the largest impact to streams and watersheds within the Ochoco Summit project area as compared to the other three alternatives.

Crossings and stream approaches would be in accordance with the Project Design Criteria (Chapter 2 of this document) to reduce movement of the trail's surface during high precipitation months of May and October (USDA 2006). The trail would be open during critical spawning dates for fish that is from March to the end of June (Wydoski and Whitney 1979) and breeding season for frogs that is early March through the end of May. Roads were closed and culverts pulled (BAER) for purposes of reducing sedimentation into streams due to the effects of vegetation removed in the Maxwell Fire in the Elliot Creek Subwatershed.

Alternative 4 would have more impact on streambanks as compared to the no action alternative and Alternatives 2 and 3 with increased stream crossings and potential disturbance during culvert or bridge installation.

Based on design criteria for construction of culvert or bridge crossings, sedimentation would increase during the construction for approximately 1/8 mile downstream. Sedimentation volume would vary depending on the size of the culvert or the type of footings for bridges. The sedimentation would be at its greatest during construction. Structures would be monitored after high flow events, which occur during the first fall/winter/spring after project completion (USDA 2008). Sedimentation would return to base after vegetation re-establishes and sediment distributes throughout the stream system taking approximately 5 days for initial sediment reduction. Reduction in sediment towards base levels would continue to occur as spring and fall rain events and snow melt occur. Areas that are currently entrenched (G and F-type channels) will continue to adjust and may take several decades to become stable with vegetation. Sediment yield from these entrenched systems would continue to exist, but would decline as streambanks adjust slope and become vegetated.

The trail would be open from May 1 to November 1 except on Paulina Ranger District, where trails would close at the beginning of the restriction period specified for the Rager Cooperative Travel Management Area, and would remain closed until May of each year. Crossings and stream approaches would be in accordance with the Project Design Criteria to reduce movement of the trail's surface during high precipitation months of May and October (USDA 2006). The trail will be open during critical spawning dates for fish that is from March to the end of June (Wydoski and Whitney 1979) and breeding season for frogs that varies from early March through the end of May. The timing of egg laying is largely a function of water temperature at the oviposition (laying and depositing eggs) site (Bull and Shepherd 2003), but other factors likely triggered movement of frogs to the oviposition site. Potential contributing factors could be photoperiod (daylight) or water temperature at overwintering sites.

Lower Beaver Creek Watershed

Alternative 4 proposes approximately 12 miles of Class III trail within the Lower Beaver Creek Watershed. Approximately, 5.9 miles of the total are proposed on existing Forest Service System Roads and approximately 5.8 miles would be new trail construction. Approximately 0.2 miles of new trail and 1.0 miles of trail on existing roads in the Lower Beaver Creek Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. A

total of three existing stream crossings are proposed for use, all of which cross intermittent streams.

North Wolf Creek and Wolf Creek Subwatershed: Within the North Wolf Creek Subwatershed, approximately 11 miles closed roads, decommissioned roads, and new routes. There is 0.46 mile of trail on existing open roads. Approximately 1.2 miles of new trail are predominately along ridges and in areas not adjacent to stream channels.

Approximately 0.2 miles of trail will be added within 300 feet of an intermittent stream, no new stream crossings will be added, and no new trail is proposed that crosses known ground water dependent ecosystems within the forest boundary portion of the subwatershed. Slope Erosion Hazard Ratings are relatively high; however, by not adding any new intermittent or perennial stream crossings and only minimal trail length near streams in the North Wolf Creek Subwatershed, the additional erosion potential from the 0.2 additional miles of trail is not expected to measurably increase sediment delivery to the streams or stream turbidity in the North Wolf Creek Subwatershed (see "Hydrology" section).

Upper North Fork Crooked River Watershed

Alternative 4 proposes approximately 47 miles of Class I trail and approximately 30 miles of Class II trail within the Upper North Fork Crooked River Watershed. Approximately 30 miles of trail are proposed on closed roads, decommissioned roads, and new routes. Approximately 47 miles are proposed on existing open roads. Approximately 6.5 miles of new trail and 17 miles of trail on existing roads in the Upper North Fork Crooked River Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams ("Hydrology" section in Chapter 3 of this document). Proposed are 9 crossings on Class II streams, 3 crossings on Class III streams and 45 crossings on Class IV streams.

Healthy populations of redband trout and Columbia spotted frogs are known to inhabit Allen, East Fork Allen, Peterson and Elliot creeks (ODFW).

Elliot Creek Subwatershed: Within the Elliot Creek Subwatershed, approximately 9.0 miles of Class I trail are located on existing Forest Service System Road and approximately 4.3 miles of Class I new trail are proposed to be constructed as part of Alternative 4. Alternative 4 proposes for Class I trails to cross perennial and intermittent streams at 13 locations at existing stream crossings on existing roads and to cross perennial and intermittent streams with new trails at eight locations.

Maxwell Fire affected 2,317 acres in Allen Creek and East Fork Allen Creek. The Maxwell Fire BAER included rehabilitation work on segments of two roads within Allen Creek in the Elliot Creek Subwatershed, FS 2200-505 and FS 2200-500. The culvert on FR2200-550 was removed and the culvert replaced on FR22 (near Allen Creek Horse Camp) to facilitate sediment movement downstream from vegetation removal by Maxwell Fire (2006). Culverts were removed and out sloped drain dips with outlets armored were constructed on FR2200-500, 2200-550, and 2200-505 (tributary to Elliot Creek) as identified in the Maxwell BAER (2006). These roads were closed. Approximately 0.04 miles of Class I trail overlap FS 2200-500 where water bars were recommended for installation to enable roads to better handle expected surface runoff increases. Approximately 0.24 miles of Class I trail overlap FS 2200-505, which crosses one intermittent and one perennial tributary to Elliot Creek and parallels the stream within the RHCA for almost the entire segment length. The crossing over the perennial tributary to Elliot Creek was undersized and was removed as part of the Maxwell Fire BAER rehabilitation. Based on design criteria, implementation of the Alternative 4 trail system would require installation of a culvert or bridge at this stream crossing location. Based on the BAER report for the Maxwell Fire, the vegetative recovery period was seven years, which would indicate hydrologic recovery should

occur by the end of the summer of 2013. However, monitoring would need to be implemented to determine the extent of vegetation recovery before a proposed trail is constructed.

The Maxwell Fire BAER included rehabilitation work on segments of one road within the Peterson Creek Subwatershed, FS 2200-550. Approximately 0.18 miles of Class I trail overlap FS 2200-550, which crosses Allen Creek, a fish-bearing perennial stream. The crossing structure was removed and banks were laid back as part of the Maxwell Fire BAER rehabilitation. Based on design criteria, implementation of the Alternative 4 trail system would require installation of a culvert or bridge at this stream crossing location. The operational maintenance level of this road is Level I (closed); however, the objective maintenance of this road is decommissioned, likely attributed to the potential for sedimentation into a high quality, fish-bearing perennial stream. Based on the BAER report for the Maxwell Fire, the vegetative recovery period was seven years, which would indicate hydrologic recovery should occur by the end of the summer of 2013. Field trips to the site during the summer of 2011 indicated that Allen Creek, in the vicinity of this stream crossing, was still in an unstable state and was still in the process of recovering from impacts from the Maxwell Fire. Monitoring of vegetative recovery is to be done prior to trail construction (Project Design Criteria).

Approximately 1.7 miles of trail will be added within 300 feet of an intermittent stream, eight new stream crossings will be added, and 0.3 miles of trail are proposed that intersect ground water dependent ecosystems or their RHCAs within the forest boundary portion of the subwatershed. Slope Erosion Hazard Ratings are relatively high, making erosion and potentially sediment delivery more likely in the Subwatershed ("Hydrology" section in Chapter 3 of this document). Sediment delivery estimates for this project indicate an addition of a relatively high amount of sediment delivery to the no action alternative.

Sedimentation during the runoff during snow melt in the spring of 2007 increased from the loss of filtering vegetation in the RHCAs in the Allen, East Fork Allen and Elliot Creeks (BAER Hydrology Report 2006).

Potential increases in water temperatures and sedimentation in stream reaches within and below moderate to high severity burn areas were identified as values at risk with Allen, East Fork Allen and Elliot creeks in the Maxwell BAER Hydrology Report (2006). Threats to water quality included loss of stream-side shade and sedimentation from upland erosion and sedimentation resulting from increased flows and debris.

Based on design criteria for construction of culvert or bridge crossings, sedimentation would increase during the construction for approximately 1/8 mile downstream. Sedimentation volume would vary depending on the size of the culvert or the type of footings for bridges. The sedimentation would be at its greatest during construction. Structures would be monitored after high flow events, which occur during the first fall/winter/spring after project completion (USDA 2008). Sedimentation would return to base after vegetation re-establishes and sediment distributes throughout the stream system taking approximately 5 days for initial sediment reduction. Reduction in sediment toward base levels would continue to occur as spring and fall rain events and snow melt occur. Continuous use of trail on FS 2200-500 and FS 2200-505 by Class I vehicles (within the high slope erosion hazard sediment delivery zone of streams with fish and frogs) would contribute sediment filling pools and covering areas where fish spawn and frogs breed. The trail opens May 1 and overlaps with redband spawning by 2 months for emergence and 1 month for breeding frogs.

Filtering vegetation in the watersheds was removed during the Maxwell Fire, especially in the headwaters. The vegetative recovery period was estimated to be 7 years based on WATSED tables (BAER 2006 Hydrology Report) that would be at the end of the 2013 growing season.

Vegetation will have 5 growing seasons at the end of 2012, not completing time needed for adequate riparian vegetation growth.

Field observations indicate that most of the shade has been lost in moderate to high fire severity polygons, with most of the shade coming from standing dead trees. Approximately 4 miles of perennial streams in the Maxwell Fire burned at moderate to high severity. Fish bearing reaches included, 0.4 miles of Allen Creek, and 1.9 miles of East Fork Allen Creek. Allen Creek burned at moderate to high severity. Monitoring of vegetation improvement is to be completed before construction of the trail (PDCs) to verify that post-fire sedimentation has returned to base level.

Since peakflow increases are expected to be minor and design criteria require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, overall bank stability is likely to be maintained. At site specific locations; however, by converting a closed road, with an objective maintenance of decommissioned, to Class I trail that crosses Allen Creek in an unstable portion of the stream and by adding two miles of Class II trail on a High Slope Erosion Hazard slope near Peterson Creek, site specific locations may experience higher incidents of unstable banks and sediment delivery (Hydrology).

Based on site specific sediment delivery and bank stability concerns, Alternative 4 proposed trails have the potential to increase sediment delivery to streams and unstable banks at site specific locations, which would delay recovery to LRMP standards of bank stability in Allen Creek and potentially add to sediment and turbidity increases in Peterson Creek.

Based on high Slope Erosion Hazard conditions, increases in both road/trail densities within the sediment delivery zone, and increases in stream crossing densities, new trails proposed in Alternative 4 have the potential to increase sediment delivery to streams that are in an unstable condition.

Howard Creek Subwatershed: Within the Howard Creek Subwatershed, approximately 5.9 miles of Class I trail are located on existing Forest Service System Road and approximately 7.9 miles of new Class I trail are proposed to be constructed as part of Alternative 4. Alternative 4 proposes for Class I trail to cross perennial and intermittent streams at existing stream crossing locations at two locations and with new trails at four locations.

Approximately 1.5 miles of trail will be added within 300 feet of an intermittent stream, four new stream crossings will be added, and 1.2 miles of trail are proposed that intersect ground water dependent ecosystems or their RHCAs within the forest boundary portion of the subwatershed.

Based on increases in both road/trail densities within the sediment delivery zone and within and near ground water dependent ecosystems, Alternative 4 proposed new trails have the potential to increase sediment delivery to streams ("Hydrology" section in Chapter 3 of this document). Class I trails within the sediment delivery zone of streams with fish and frogs would contribute sediment, which may affect spawning and breeding habitat. The trail opens May 1 and overlaps with redband spawning by 2 months for emergence and 1 month for breeding frogs.

Peterson Creek Subwatershed: Within the Peterson Creek Subwatershed, approximately 13 miles of Class I trail and 4.8 miles of Class II trail are located on existing Forest Service System Road and approximately 5.4 miles of Class I trail and 2.5 miles of Class II new trail are proposed to be constructed as part of Alternative 4. Alternative 4 proposes for Class I trails to cross perennial and intermittent streams with new trails at four locations and to cross perennial and intermittent streams on existing roads at four locations. Class II trails are proposed to cross perennial and intermittent streams at no new locations and to cross perennial and intermittent streams at five locations at existing stream crossings on existing roads.

The Maxwell Fire BAER rehabilitation road treatments, included rehabilitation work on segments of one road within the Peterson Creek Subwatershed, FS 2200-550. Approximately 0.18 miles of Class I trail overlap FS 2200-550, which crosses Allen Creek, a fish-bearing perennial stream. The crossing structure was removed and banks were laid back as part of the Maxwell Fire BAER rehabilitation. Based on design criteria, implementation of the Alternative 4 trail system would require installation of a culvert or bridge at this stream crossing location. The operational maintenance level of this road is Level I (Closed); however, the objective maintenance of this road is decommissioned, likely attributed to the potential for sedimentation into a high quality, fish-bearing perennial stream. Based on the BAER report for the Maxwell Fire, the vegetative recovery period was seven years, which would indicate hydrologic recovery should occur by the end of the summer of 2013. Field trips to the site during the summer of 2011 indicated that Allen Creek, in the vicinity of this stream crossing, was still in an unstable state and was still in the process of recovering from impacts from the Maxwell Fire.

At site-specific locations where sediment delivery and bank stability are of concern, proposed trails may contribute additional sediment to streams in this subwatershed, which could affect spawning and breeding habitat for fish and frogs.

Porter Creek Subwatershed: Within the Porter Creek Subwatershed, approximately 0.7 miles of Class I trail and 14 miles of Class II trail located on existing Forest Service System Road are proposed in Alternative 4. Approximately 0.8 miles of Class I and 8.8 miles of Class II new trail are proposed to be constructed as part of Alternative 4. No Class I trails are proposed to cross intermittent or perennial stream channels in Alternative 4. Class II trails are proposed to cross perennial and intermittent streams at 13 existing stream crossings and at six new locations.

The jeep boulder crawl proposed in Alternative 2 in Peterson Creek Subwatershed is proposed as a jeep trail in Alternative 4 in the Porter Creek Subwatershed.

The jeep trail lies along East Porter Creek along FR3000-550 in the RHCA. East Porter Creek is a Class II stream. The position of the road to be used for a trail is rocky terrain appropriate for jeeps. In gully areas, boulders would be placed to prevent erosion. The roads analysis for Howard Elliot Johnson EIS (HEJ 2010) indicates FR3000-550 be changed to a trail for protection of aquatic species. Mile 2.3 to 4.8 of FR3300-550 crosses a stream Class III and IV on existing crossing. The jeep trail would not cross East Porter Creek but would cross on an existing culvert on a tributary on FR3300-553. The small portion of the trail in the sediment delivery zone has a stable road bed. The existence and use of trail on by Class II (jeeps) vehicles (within the sediment delivery zone of streams with fish and frogs) would not likely contribute sediment where fish spawn and frogs breed.

Deep Creek Watershed

Alternative 4 proposes approximately 12 miles of Class III trail within the Lower Beaver Creek Watershed. Approximately, 5.9 miles of the total are proposed on existing National Forest System Roads and approximately 5.8 miles would be new trail construction. Approximately 0.2 miles of new trail and 1.0 miles of trail on existing roads in the Lower Beaver Creek Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. A total of three existing stream crossings are proposed for use, all of which cross intermittent streams.

Some of the perennial streams that have been identified by Forest fish biologists and the Oregon Department of Fish and Wildlife to be critical refuges for redband trout in the watershed are Deep Creek, Little Summit Creek, Happy Camp Creek and Double Corral Creek. However, many of these systems have been impacted by past management and are not as effective as they once were

in sustaining redband trout. In addition to redband trout, Columbia spotted frogs are present throughout the area.

Lower Deep Creek Subwatershed: Within the Lower Deep Creek Subwatershed, approximately 11 miles of Class I trail are located on existing Forest Service System Road. Approximately 5.2 miles of new Class I trail and 2.4 miles of new Class III trail are proposed to be constructed as part of Alternative 4. Alternative 4 proposes for Class I trails to cross perennial and intermittent streams with new trails at four locations and to cross perennial and intermittent streams on existing roads at seven locations. Class III trails are proposed to cross perennial and intermittent streams at one new location.

Proposed restoration projects were identified in the Deep Creek Restoration Plan, some of which have already been implemented. Of the 2.8 miles of road within the sediment delivery zone of streams that were decommissioned in the Lower Deep Creek Subwatershed as part of the Deep Creek Restoration Plan, 0.7 miles of the FS 4200-600 and 0.4 miles of the FS 4200-603 decommissioned roads are planned to be reopened as Class I trails in Alternative 4. The FS 4200-600 road parallels Big Spring Creek, a fish-bearing perennial stream, for approximately 0.3 miles and parallels and intermittent tributary to Big Spring Creek for approximately 0.4 miles. The FS 4200-603 road parallels Buck Hollow, a perennial stream, for approximately 0.4 miles. The reopened portion of the FS 4200-603 road is located on high slope erosion hazard. About one-third of the reopened portion of the FS 4200-600 road is located on high slope erosion hazard, a third is located on moderate slope erosion hazard, and a third is located on low slope erosion hazard. Stream crossings would be installed with both of these road segments. Based on design criteria, implementation of the Alternative 4 trail system would require installation of a culvert or bridge at these stream crossing locations.

Estimates of sediment delivery indicate that Alternative 4 has the potential to add a high amount of sediment delivery relative to the no action alternative (Alternative 1), similar to Alternative 2, but more than Alternative 3.

Establishing a Class I trail on a decommissioned road that is a high sediment source to Big Spring Creek would increase fines in the substrate affecting fish habitat reducing potential spawning success; therefore, does not meet the intent of INFISH on the high slope erosion portion of the trail and prevent improvement of the decommissioned road. The Deep Creek Restoration Plan was to improve overall stream and riparian health and integrity within the watershed and improve water quality and associated habitat suitable for use by redband trout and other aquatic lifeBased on design criteria for construction of culvert or bridge crossings, sedimentation would increase during the construction for approximately 1/8 mile downstream. Sedimentation volume would vary depending on the size of the culvert or the type of footings for bridges. The sedimentation would be at its greatest during construction. Structures would be monitored after high flow events, which occur during the first fall/winter/spring after project completion (USDA 2008). Sedimentation would return to base after vegetation re-establishes and sediment distributes throughout the stream system taking approximately 5 days for initial sediment reduction. Reduction in sediment towards base levels would continue to occur as spring and fall rain events and snow melt occur.

Approximately 1.1 miles of trail would be added within 300 feet of an intermittent or perennial stream, four new stream crossings would be added, and 0.5 miles of trail are proposed that intersect GDEs or their RHCAs within the forest boundary portion of the subwatershed. In addition, approximately 1.1 miles of decommissioned roads within 300 feet of streams are proposed to be reopened as Class I trails as part of Alternative 4. By adding approximately 1.1 miles of trail to the road/trail network within the sediment delivery zone of streams in the Lower Deep Creek Subwatershed, the road/trail densities increase from 5.5 to 5.7 miles per square mile,

both of these densities are low relative to the other Ochoco Summit project area Subwatersheds analyzed. The addition of virtually 0.5 new miles of trail within GDEs and associated RHCAs increases road densities in GDEs from 7.6 to 8.1 miles per square mile, both of which are high relative to the other subwatersheds. Estimates of sediment delivery in the indicate that Alternative 4 has the potential to add sediment roughly the same as Alternatives 2.

At the location of the new Class I trail stream crossing on Deep Creek, the channel type indicates that the channel should have very high streambank erosion potential. Since peak flow increases are expected to be minor and design criteria require the installation of a culvert or bridge installation that meets the 100-year flow event as well as armored approaches, overall bank stability is likely to be maintained. At site specific locations, bank stability and increased sediment delivery may be of concern by reopening decommissioned roads that cross and parallel Big Springs Creek and Buck Hollow, a portion of which are on a High Slope Erosion Hazard slope.

Based on site specific sediment delivery and bank stability concerns, Alternative 4 proposed trails have the potential to increase sediment delivery to streams overall and unstable banks at site specific locations, which would potentially add to sediment and turbidity increases in Deep Creek. Increases in sediment would cover spawning for redband trout and breeding frogs and affect emergence of fry. The season of use proposed for the trail overlaps spawning and emergence of redband trout by 2 months and breeding of frogs by 1 month. Increases in sediment on trails within the sediment delivery zone would affect redband trout and Columbia spotted frogs. Existence and use of trail by Class I or Class II vehicles within the sediment delivery zone of streams with fish and frogs would contribute sediment potentially covering areas where fish spawn and frogs breed. The trail opens May 1 and overlaps with redband spawning by 2 months for emergence and 1 month for breeding frogs.

Jackson Creek Subwatershed: Within the Jackson Creek Subwatershed, approximately 13 miles of Class I trail and 20 miles of Class III trail are located on existing Forest Service System Road. Approximately 7.0 miles of new Class trail and 7.4 miles of new Class III trail are proposed to be constructed as part of Alternative 4. Class I trails are proposed to cross intermittent or perennial streams at four existing locations and six new locations in Alternative 4. Class III trails are proposed to cross perennial and intermittent streams at at 14 existing stream crossings and at two new locations.

Approximately 1.5 miles of trail will be added within 300 feet of an intermittent or perennial stream, eight new stream crossings will be added, and 0.5 miles of trail are proposed that intersect ground water dependent ecosystems or their RHCAs within the forest boundary portion of the subwatershed. Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Jackson Creek Subwatershed. Estimates of sediment delivery indicate that Alternative 4 has the potential to add a high amount of sediment delivery relative to the no action alternative (Alternative 1), similar to Alternative 2, but more than Alternative 3.

Based on slight increases in both stream crossing and road/trail densities within the sediment delivery zone and in ground water dependent ecosystems, as well as overall moderate Slope Erosion Hazard Conditions, and localized high Slope Erosion Hazard Conditions, Alternative 4 proposed new trails have the potential to have a moderate to high sediment delivery increase to streams and ground water dependent ecosystems; however, banks stability is likely to be maintained (“Hydrology” section in Chapter 3 of this document).

Some of the perennial streams that have been identified by Forest fish biologists and the Oregon Department of Fish and Wildlife to be critical refuges for redband trout in the watershed are Deep Creek, Little Summit Creek, Happy Camp Creek and Double Corral Creek. However, many of these systems have been impacted by past management and are not as effective as they once were

in sustaining redband trout. In addition to redband trout, Columbia spotted frogs, are present throughout the area.

Overall, slope erosion hazard conditions are moderate in the vicinity of streams in the Jackson Creek Subwatershed. Increases to the road/trail densities in combination with slight increases to the stream crossing density have the potential to increase effects to the flow and sediment regime as a result of Alternative 4; however, with low drainage density these increases may be relatively minor.

The Deep Creek Roads Analysis, Deep Creek Restoration Plan, and Deep Restoration Environmental Analysis identified change in operational maintenance. The following roads were proposed to be decommissioned in Jackson Creek Subwatershed proposed to be opened for construction of trail: FR1200-504, FR3000-802, FR3000-930, and FR4250-608. In addition,

Alternative 4 proposes to open 2 decommissioned roads identified in the Deep Creek Restoration Plan: 0.7 mi of 4200-600 and 0.4 mi of 4200-603; both segments approximately 100 ft. from the stream. Constructing OHV trail on roads that have been identified for decommissioning because of sediment inputs to streams may affect habitat for Columbia spotted frogs and redband trout; however, project design criteria would reduce the severity of effects.

Little Summit Prairie Creek Subwatershed: Within the Little Summit Prairie Creek Subwatershed, approximately 5.1 miles of Class I trail and 3.6 miles of Class III trail are located on existing Forest Service System Road. Approximately 3.2 miles of Class I trail and 5.6 miles of Class III new trail are proposed to be constructed as part of Alternative 4. Class I trails are proposed to cross perennial and intermittent streams at one existing stream crossing location and two new locations. Class III trails are proposed to cross perennial and intermittent streams at two existing stream crossing locations.

Estimates of sediment delivery indicate that Alternative 4 is relatively the same as Alternatives 2 except in the area of FR4270-508 in Alternative 4. This road was proposed to be decommissioned in the Deep Creek Restoration Plan due to sediment concerns to aquatic habitat. Approximately 0.52 mile of road is within the 300-foot sediment delivery zone of Little Summit Creek.

Upper Ochoco Creek Watershed

Alternative 4 proposes approximately 37 miles of Class I trail within the Upper Ochoco Creek Watershed. Approximately 33 miles of trail are on closed roads, decommissioned roads or new routes. Approximately 4 miles is on existing open roads. Approximately 1.3 miles of new trail and 4.4 miles of trail on existing roads in the Upper Ochoco Creek Watershed are located within the sediment delivery zone of 300 feet from perennial or intermittent streams. There are 4 stream crossing proposed on Class II streams, 5 on Class III streams, and 15 on Class IV streams.

Upper Marks Creek Subwatershed: Within the Upper Marks Creek Subwatershed, approximately 20 miles of Class I trail are located on existing Forest Service System Road. Approximately 14 miles of new Class I trail are proposed to be constructed as part of Alternative 4. Alternative 4 proposes for Class I trail to cross perennial and intermittent streams on existing roads at 17 locations and at new stream crossings at seven locations.

Based on increased road/trail densities, stream crossing densities, road/trail densities in the vicinity of streams and ground water dependent ecosystems, and channel type conditions in the Upper Marks Creek Subwatershed; Alternative 4 proposed trails have the potential to increase sediment delivery to streams and unstable banks, which would potentially add to sediment and turbidity increases in Marks Creek (“Hydrology” section in Chapter 3 of this document).

Estimates of sediment delivery indicate that Alternative 4 has the potential to add a relatively high amount of sediment delivery relative to all other alternatives. Based on increases in stream

crossing densities and road densities in ground water dependent ecosystems and near streams, as well as sediment delivery estimates, sediment delivery effects are expected to be moderate to high in Alternative 4 for the Upper Marks Creek Subwatershed. Increasing sediment in the substrate of streams can affect spawning and breeding success of fish and frogs.

Table 89. Summary of effects of Alternative 4.

Impacts and Measures	Alternative 4	Effect to Streams
Impact to fish & frog habitat at and below stream crossings	Miles of trail over Class I, II, and III = 17.56 miles in RHCAs. User created routes only restored where confusion may occur at trail opening; the rest of the routes and closed roads used by OHVs would not be restored or maintained; roads in RHCAs continue to input sediment into streams with potential reducing habitat available to aquatic species; design criteria would reduce sediment movement on stream crossing approaches by constructing hardened approaches to stream crossings with structure such as concrete blocks to minimize movement of the trail surface at crossings and sediment entering streams during rain events.	*Lower Deep Cr: Buck Hollow and Big Springs:* Class I (OHV) trail, reopening FS4200-603 on high slope erosion hazard for approximately 0.5 miles and 0.3 mi of 4200-600 approximately 100 ft. from stream; fines would increase in Buck Hollow Creek affecting fish habitat. *Elliot Cr*: FR2200-550 increasing sediment; this road was determined maintenance objective decommission for aquatic species for 0.3 miles of trail that intersects groundwater dependent ecosystems or their RHCAs; slope erosion hazard ratings are relatively high, making erosion and potentially sediment delivery to streams more likely in the subwatershed; using this road and adding the crossing affects fish habitat and species; does not meet maintenance objective decommission for sediment impacts to aquatic species. *Allen Creek and East Fork Allen Creek, Peterson Cr:* Approximately 0.4 miles of Allen Creek and 1.9 miles of East Fork Allen Creek, fish bearing streams, burned at moderate to high severity. Based on high slope erosion hazard conditions, there is potential to increase sediment delivery to streams. PDC states that the recovery from the Maxwell Fire has been met before construction of the trail. Has potential to increase sediment delivery to streams and unstable banks at site specific locations, affecting potential fish spawning and frog breeding. *Upper Marks Creek:* Based on increases in stream crossing densities and road densities in groundwater dependent ecosystems and near streams, as well as sediment delivery estimates, sediment delivery effects are expected to be moderate to high in Alternative 4 for the Upper Marks Creek Subwatershed. Estimates of sediment delivery indicate that Alternative 4 has the potential to add a relatively high amount of sediment delivery relative to all other alternatives. Based on increases in stream crossing densities and road densities in groundwater dependent ecosystems and near streams, as well as sediment delivery estimates, sediment delivery effects are expected to be moderate to high in Alternative 4 for the Upper Marks Creek Subwatershed. Sediment has the potential to increase in streams resulting in filling pools used by aquatic species. Increasing sediment in substrate of streams could affect potential for fish spawning and frog breeding.

Table 89. Summary of effects of Alternative 4.

Impacts and Measures	Alternative 4	Effect to Streams
Reduce effectiveness of restoration in Deep, Crazy, Little Summit, Elliot Creeks subwatersheds	Culverts were pulled and roads closed (with management objective to decommission) because of sediment issues and impacts to aquatic species would be reopened for the OHV trail (see p. 21-28) (Maxwell Fire 2006); would not promote an upward trend as a result of restoration; Deep has decommissioned roads proposed to be turned into the trail; would not promote an upward trend.	Areas of concern for aquatic species (see narrative): *Jackson Cr*, decommissioned roads proposed to construct trail; *Little Summit Prairie Creek:* decommissioned road in Deep Cr Restoration Plan closed because of excessive sediment into streams proposed for trail; *Lower Deep Creek:* roads decommissioned due to excessive sediment to streams proposed for trail construction affects Big Spring Creek, Buck Hollow, West Fork of Crazy Creek; *Elliot Cr:* roads closed, culverts pulled, and out sloped drain dips with outlets armored proposed to construct trail; *Peterson Cr*, increase in sediment and cut bank; *Porter Cr;* jeep trail along East Porter Creek, class II stream, increasing sediment; *Marks Creek*, increase in sediment .
Impacts to streambanks	Culverts and bridges will be used for Class I, and II streams, and Class III streams where it flows into Class I or II (determined individually) (no fords) except where mixed use roads are used for both highway + non highway legal vehicles; impacts of sediment from trails within the 300-foot sediment deliver zone would continue from OHV use until the Travel Rule is enforced and revegetated (10-15 years); culverts would increase sediment from construction below bankfull of streams and existing undersized culverts used on trail. Maxwell BAER and Deep Restoration Plan have decommissioned roads and management objective of decommissioned areas that are reopened.	Cut bank would increase in Upper Marks Creek Subwatershed.

Table 89. Summary of effects of Alternative 4.

Impacts and Measures	Alternative 4	Effect to Streams
Delivery of upland soil to riparian areas	Out slope and harden approaches to streams using materials such as concrete blocks that do not allow movement of soil or gravels or erosion or similar design that strengthens unstable surfaces would reduce sedimentation into streams. Hardening would occur where the trail enters and exits the stream crossing to a gradient break for no more than 100 feet. At this point, construct rolling dips of such size that it would not need maintenance. If the trail continues up hill, continue constructing the rolling dips approximately every 50 feet or where there is a break in grade to prevent channelizing sediment into streams especially during snow melt, rain events, or rain-on-snow events. This will reduce rutting potential and road surface materials transporting into streams during the wet season, mid-October to mid-June (BAER 2006) or during rain events throughout the summer season provided there is sufficient vegetation on the margins of the trail. On unmanaged (no maintenance) OHV routes, upland soils from roads leading to streams where approaches are steep leading to crossings, carry sediment and contaminants to streams in ruts could flow into streams. Created routes remain on the landscape and are not maintained as a result of this project. On managed trails sediment and contaminants could increase especially at jeep crawl/trail sites.	Generally, design features (Chapter 2) would reduce rutting potential and road surface materials transporting into streams during the wet season, mid-October to mid-June (BAER 2006) or during rain events throughout the summer season provided there is sufficient vegetation on the margins of the trail.
Miles of trail in Deep Cr Watershed and Upper North Fork Crooked River Watershed	Deep Cr Watershed: 83.09 mi. Upper North Fork Crooked River Watershed: 26.82 mi.	Of 212 miles of trail proposed, 69% of the trail are in these 2 watersheds that include Jackson, Little Summit Prairie, and Lower Deep creek subwatersheds (Deep Cr Watershed); and Elliot (includes Allen and East Fork Allen creeks), Howard, Peterson, and Porter creek subwatersheds (Upper North Fork Crooked River). These 2 watersheds are considered sensitive aquatic habitat areas and have the majority of the proposed trail in Alternative 4.
Trail over stream crossings by stream class	Class 1: 7 Class 2: 20 Class 3: 11 Class 4: 92	

Table 89. Summary of effects of Alternative 4.

Impacts and Measures	Alternative 4	Effect to Streams
Miles of trail in anadromous watershed-Rock & Bridge Creeks	0.89 mi. trail; no sediment could reach stream channels; miles of unmanaged routes that would not be maintained unknown; no effect to anadromous fish or their habitat	Anadromous watersheds in the project area do not have trails that are within the sediment delivery zone that would impact aquatic species or their habitat. Consultation is not needed.
Trail in RHCAs by 6th HUC (within 300 feet of the sediment delivery zone)	Deep Creek Watershed: 43 mi. Jackson Cr Subwatershed 26 mi Little Summit Prairie Sub 5 Lower Deep Cr Sub 12 Upper North Fork Crooked River Watershed:60 mi Elliott Cr Subwatershed mi Howard Creek Sub 3.8 Peterson Creek Sub 4.9 Porter Creek Sub 9.2 Upper Ochoco Creek 0.9 mi Upper Marks Creek 5.7 mi Lower Beaver Creek: 1.3 mi North Wolf Creek 1.3 mi	See Table 83 for specific locations with hydrologic concerns.

Cumulative Effects

For Alternatives 2, 3, and 4: Implementation of the Travel Rule will restrict motorized travel to designated routes identified in the MVUM (Motor Vehicle Use Map). Roads not proposed for designation as a motor vehicle route in the project are not proposed to be closed, decommissioned or maintained. Their presence in the watershed and location in RHCAs will have a long-term adverse effect on water quality since the roads and routes will not be properly maintained (Burroughs and King 1984).

Long-term failure of poorly maintained road segments can produce sediment that would far exceed the short-term benefits. When road closures are not maintained, roads become stream channels during runoff events. The natural erosion process will continue to wear on these channels until they reach equilibrium with the slope. This natural process, if unchecked, can result in hundreds or even millions of cubic yards of material being eroded from the original road over time (Burroughs and King 1984).

There will continue to be a direct effect to fish and frogs and their habitat from the existence of user created off-road routes through streams (fords), ponds, and wetlands and routes parallel to streams located within RHCAs until these roads and routes have been decommissioned, closed and/or maintained and are no longer used. Reestablishing vegetation for the routes within RHCAs is needed for filtering sediment and reducing sediment reaching streams.

Table 90 describes the current and foreseeable projects within the project area for cumulative effects.

Table 90. Current and foreseeable projects within the Ochoco Summit project area relative to cumulative effects to aquatic species.

Project	Description of Activities and Effects
Marks Creek grazing EIS Decision Notice (2011)	Livestock may be displaced by high use on the trail system and distribution throughout the project area could also be negatively affected with the increase of off road use in localized areas. If livestock distribution is decreased, localized areas in uplands and riparian areas may receive greater utilization.
Howard Elliot Johnson vegetation & fuels EIS Decision Notice (2011)	A roads package would be included in the proposal for commercial harvest that may require building temporary and specification roads. Roads built for the timber sale could be confused with OHV users identifying the trail that is constructed. In some areas in HEJ, roads in riparian areas are reused then decommissioned. OHVs on these roads could cause increased sedimentation into streams that could increase fines to the stream substrate. HEJ project implementation could take up to 10 years to complete.
Deep Creek Restoration Plan (2009)	The Restoration Plan is in place and has Trout Unlimited as a partner to help implement the plan. The Plan is aimed to improve fish habitat and reduce sedimentation in the watershed as a result of the past impacts. Building an OHV trail in the Deep Watershed where trail is proposed on roads to be closed because of sediment issues for aquatic habitat, conflicts with the objectives of the restoration plan. Opening roads to provide OHV trails would not complement road closures planned in the watershed or meet the objectives of the Plan to reduce sediment into streams. Miles of roads/routes per square mile would increase. These projects were developed to improve the habitat and the high valued fishery.
Maxwell Fire BAER (2006)	Maxwell Fire BAER stream improvements were implemented in 2006 and 2007 to reduce sediment from upland and riparian burned areas. Riparian vegetation was lost and not yet available to properly filter sediment. It is predicted to reestablish at the end of 7 years that would be 2013. This would need to be field verified for status of vegetation improvement before trail construction. Building an OHV trail in the Allen Creek watershed where trail is proposed on roads closed and culverts pulled because of sediment issues for aquatic habitat, conflicts with the objectives of the BAER plan. Roads were closed (and determined maintenance objective decommission), culverts pulled to remove traffic from the area and allow time for restoration to occur. The projects reduce sediment for high valued fishery.
Canyon Fuels and Vegetation management EIS (2010)	A roads package would be included in the proposal for commercial harvest that may require building temporary and specification roads. Roads built for the timber sale could be confused with identifying the trail that is constructed. In some areas in the project area, roads in riparian areas are reused then decommissioned. OHVs on these roads could cause increased sedimentation into streams that could increase fines. Canyon project implementation could take up to 10 years to complete.
Jackson Fuels and Vegetation Management Project EIS (2012)	A roads package would be included in the proposal for commercial harvest that may require building temporary and specification roads. Roads built for the timber sale could be confused with identifying the trail that is constructed. In some areas in the project area, roads in riparian areas are reused then decommissioned. OHVs on these roads could cause increased sedimentation into streams that could increase fines. Project implementation could take up to 10 years to complete.

Table 90. Current and foreseeable projects within the Ochoco Summit project area relative to cumulative effects to aquatic species.

Project	Description of Activities and Effects
Travel Rule 2011	The Travel Rule identified that forest travel for motorized vehicles would travel on designated routes only. No future use is to occur on decommissioned roads that have been used by off road travel and closed roads that have been breached by off road travel. After the user created routes and closed roads are no longer used by OHVs, it is estimated to take a minimum of 10 years to reestablish filtering vegetation. In areas where it is not a moist site, it is estimated to take 15 or more years. On scab areas, it may not reestablish its vegetation (District Botanist 2010). In areas where roads are rutted and the water table has dropped, weeds will replace the vegetation removed from off road travel. Maintenance of these routes is not proposed.

Determination

All alternatives 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 (MIIH) to redband trout and Columbia spotted frogs. Although the trail proposal would not likely contribute to a trend towards federal listing, the proposed trail would have effects to fish and frogs and their habitat in specific sites identified in the effects section.

INFISH

Project Design Criteria are identified to mitigate the effects of sediment that has potential to enter streams as a result of building a trail for off road vehicles located in high erosion areas within 300 feet of the sediment delivery zone. In general, all alternatives are consistent with INFISH over the majority of the project area; however, there are specific sites in each Alternative where building a trail would "slow the rate of recovery below the near natural rate of recovery if no additional human caused disturbance was placed on the system" (INFISH A-6 & 9, RM-1.) See Table 83 and summary tables for Alternatives 2, 3, and 4 that display areas of sediment concern to aquatic species.

Management Indicator Species

Introduction

The Ochoco Forest Plan identifies a number of fish species as Management Indicator Species (MIS) for healthy stream/riparian habitats. Riparian ecosystems occur at the margins of standing and flowing water, including intermittent stream channels, ephemeral ponds, and wetlands. The aquatic MIS were selected to indicate healthy stream and riparian ecosystems across the landscape. Attributes of a healthy aquatic ecosystem includes: cold and clean water; clean channel substrates; stable streambanks; healthy streamside vegetation; complex channel habitat created by large wood, cobbles, boulders, streamside vegetation, and undercut banks; deep pools; and waterways free of barriers. Healthy riparian areas maintain adequate temperature regulation, nutrient cycles, natural erosion rates, and provide for instream wood recruitment.

Identified Forest Plan MIS species that may be present in the project area are rainbow trout (*Oncorhynchus mykiss*) and brook trout (*Salvelinus fontinalis*). In the 1920s and 1930s, Oregon Department of Fish and Wildlife stocked brook and rainbow trout in streams on the Ochoco National Forest to enhance fishing opportunities. Brook trout are not native to the Ochoco National Forest or the Crooked River National Grassland, are not currently stocked or managed for by ODFW, and are not part of ODFW's overall native fish policy. Rainbow trout also no longer are stocked. Both species may reproduce in Class I and II streams in the project area. No further evaluation for brook trout will be discussed in this section (Rife 2011). Rainbow trout will

be addressed by discussing redband trout, as redband trout are known to naturally occur in the Class I and II streams on the Ochoco National Forest.

The redband trout (inland rainbow trout) is indigenous to Central Oregon. Redband trout is a subspecies of rainbow trout and steelhead, and is adapted to the arid conditions east of the Cascades. Historically, they were found throughout Central Oregon in waters connected to the Deschutes River.

Fish distribution, upstream limits and abundance were determined by visual observations, electrofishing (mark and recapture), field presence/absence surveys, aquatic inventory surveys, escapement data and redd surveys. Data come from several sources including Forest Service watershed baseline updates, Forest Service Level II and Bottom Line stream survey reports on major fish-bearing streams, and Oregon Department of Fish and Wildlife Physical and Biological surveys and spawning surveys (Stuart et al 2007).

This MIS analysis assumes that activities that maintain and improve aquatic/riparian habitat will provide for resident fish population viability within the project area.

Threats and Risks

Like other western salmonids, populations of redband trout have declined because of a complex combination of land and water practices (logging, mining, agriculture, grazing, and dams), overharvest, and hybridization and competition with nonnative fishes (Williams et al. 1989; Behnke 1992). In a study completed in Montana and the upper Columbia River drainage, Muhlfeld found that genetically pure populations persist only in a few locations above barrier falls in headwater streams. Knowledge of the habitat requirements of redband trout is critical for protection of existing populations and restoration of this subspecies.

Unmanaged OHV use on federal lands has resulted in user created routes, soil erosion, watershed and wildlife habitat damage, impacts to cultural sites, safety concerns, trespass and vandalism on adjacent private land and conflict between motorized and non-motorized recreational experiences. Streams, ponds, and springs have lost vegetation, and increased sedimentation resulting from off road (OHV) use. Habitat for aquatic species has been altered. User created routes and open roads located within the 300-foot sediment delivery zone continue to deliver sediment filling pools.

Historically, redband trout may have occupied more aquatic habitat within the watershed analysis area than presently. Road densities, livestock grazing, timber harvests, and mining have contributed to a reduction in suitable habitat and increased fish passage barriers. Ochoco Dam and other non-passable irrigation diversions contribute to fragmentation of native redband trout populations. This further increases risk for localized extinctions and can limit the long-term sustainability of these native trout populations. The Ochoco OHV project area is located upstream from Ochoco Dam.

Pools would be at risk from sediment from trail that is within the 300-foot sediment delivery zone. Sediment in riffles during spawing seasons in the spring and fall for redband trout would risk spawning success affecting population sizes. Miles of trail within the sediment delivery zone is discussed in the Hydrolgy section of Chapter 3 of this document.

Life History and Habitat Requirements

Redband trout are the only native game fish left known the upper basin and reside primarily in the headwaters of smaller tributaries located on the National Forest. Most of the populations have been fragmented and isolated due to physical and water temperature barriers.

For more detailed information, please refer to the redband trout discussion in the section titled “Threatened, Endangered and Sensitive Species” under the “Aquatic Species” heading in Chapter 3 of this document.

Redband trout spawn during the spring (between March and the end of June, depending on water temperatures and timing of spring runoff) in rivers and streams. Egg deposition occurs in stream areas that have adequate water depth and velocity and appropriate sized gravels for redd construction. Cool, clean, well-oxygenated water is necessary for the eggs to survive. The number of eggs per female varies greatly, often ranging from 200-9,000 eggs, depending on the size and condition of the female (Wydoski and Whitney, 1979).

Muhlfeld (2002) studied redband trout of similar size and substrate to those found in the Ochoco Summit project area. Results of the study show substrates within redds comprised small gravel (2-6 mm; 76% when averaged across all redds), large gravel (6-75 mm; 15%) and fines (<2 mm; 9%). Most redband trout redds (80%) were located in pool tailouts, which provide optimal spawning conditions in terms of water depth, water velocity, and substrate composition. Pool tailouts are important to the survival of salmonid embryos, offering favorable conditions for seepage velocity of interstitial water, oxygenation of eggs, and remove of waste products (Chapman and Bjornn 1969; Sowden and Power 1985; Bjornn and Reiser 1991).

Egg incubation is temperature dependent, thus eggs deposited early in the year take longer to incubate and emerge than eggs deposited later in the spring after water temperatures have increased. Redband trout fry emerge from the gravel in June and July. For the most part, they live near where they were spawned; during the fry and parr life stages, redband trout are often observed along stream margins in slower waters.

By August, most young trout in streams on the Ochoco National Forest are approximately 2-inches in length and juveniles will reach a length of approximately 5 inches by 2 years of age. Migrations of juvenile trout may begin as early as 1 year of age; however most migrate at 2 or 3 years of age (Wydoski and Whitney, 1979).

Adults are most often observed in pools near large wood or available cover. Age at maturity is 3 years with size varying depending on productivity of individual waters; few redband trout exceed 10 inches in length. Food sources for young and adults include aquatic insects, amphipods, fish and eggs and adults may also eat crustaceans when they are available (Wydoski and Whitney, 1979).

Subpopulation Sizes: Redband trout populations in the Ochoco Summit OHV project area are considered depressed to less than 10% of historical numbers, but are believed to be self-sustaining and not considered to be in immediate threat of declining precipitously according to Oregon Department of Fish & Wildlife personnel (personal communication with Brett Hodgson, ODFW District Biologist, March 2006).

Growth and Survival: No data are available for redband trout growth and survival in the Project Area.

Salmonid Diversity: Redband trout are the only salmonid species naturally occurring within the project area.

Persistence and Genetic Integrity: Hatchery rainbow trout stocked in the 1920s and 1930s in selected streams, appeared to have caused little to no hatchery genetic introgression in most of the basin. Preliminary electrophoretic results from fish collected from the North Fork Crooked River tributary streams of Howard, Fox Canyon, and Lookout creeks indicate that these trout appear to comprise a genetic group distinctly different from the remainder of the Crooked River basin (Currens 1994). The exception is Deep Creek which exhibited a moderate level of hatchery introgression from legal rainbow trout released from 1963 to 1990 (Stuart 1996).

Life History Requirements: For successful spawning, adult trout need suitable substrate (gravels ranging in size from 1/2"' to 4"), clean cold water (<70˚F) of sufficient flow to allow

successful incubation of eggs in redds and habitat that provides minimal predation during spawning. Rearing and migrating trout need habitat that provides clean, cold water, adequate food and cover and which exposes rearing trout to minimal levels of predation and fine sediment. Adult trout need holding habitat such as deep pools interacting with large wood. This type of habitat reduces their predation risk and provides cool clean water for adequate food production.

Spawning typically occurs between February and June, depending on water temperatures and location.

Effects of the Ochoco Summit OHV project on redband trout

There are three action alternatives proposed in the Ochoco Summit OHV project area. The following paragraphs summarize the potential effects of the Ochoco Summit project on MIS rainbow trout; for more detailed information, please refer to the effects analysis disclosed in the section titled "Threatened, Endangered and Sensitive Species" under the "Aquatic Species" heading in Chapter 3 of this document.

For all three action alternatives:

- In general, due to trail location and train design criteria, the project would not create measurable effects to aquatic habitats or to redband trout.
- Each action alternative includes some amount of trail within the sediment delivery zone (for details, see discussion in the section titled "Threatened, Endangered and Sensitive Species" under the "Aquatic Species" heading in Chapter 3 of this document).
- Stream disturbance from constructing trail within 300 feet of the sediment delivery zone and construction of culverts or bridges at crossings will add sediment to streams, which may affect reproductive success. When the spaces in stream substrate fill, macroinvertebrates (food for fish) are displaced. Based on design criteria for construction of culvert or bridge crossings, sedimentation would increase during the construction for approximately 1/8 mile downstream. Sedimentation volume would vary depending on the size of the culvert or the type of footings for bridges. The sedimentation would be at its greatest during construction. Structures would be monitored after high flow events that occur during the first fall/winter/spring after project completion (USDA 2008). Sedimentation would return to base after vegetation re-establishes and sediment distributes throughout the stream system taking approximately 5 days for initial sediment reduction. Reduction in sediment would continue to occur as spring and fall rain events and snow melt occur.

Conclusion

Given the project design features (Chapter 2 of this document) and the small scale of change from the existing condition (especially relative to the scale of the subwatersheds included in this project area and the Ochoco National Forest overall) that would occur in specific locations, the continued viability of redband trout is expected on the Ochoco National Forest.

Wildlife

General Effects to Wildlife

With all management activities, there are negative effects to some species and benefits to others that must be considered and balanced along with the need for those human activities. Negative effects of recreational OHV use on wildlife may include wildlife mortality, direct and indirect loss of habitat, displacement, and reduced connectivity. Factors that influence the vulnerability of different wildlife species include behavior and ecology. For example, animals that tend to stay

closer to shelter, such as gray squirrel and woodchuck, can tolerate closer encounters with humans because they can quickly escape (Frid and Dill 2002; Gill et al. 1996). Other species tend to forage less and spend less time in quality habitat near human activity (Gill et al. 1996). Still other species may respond positively to human development and use of OHV trails and roads; potential benefits are related to habitat, mobility, and food resources. Openings, shrubs and grasses may develop alongside roads, providing additional foraging habitats. Cleared roads and trails are utilized as travel corridors for some species.

No road construction is proposed for the Ochoco Summit project; however, there are ongoing effects of existing roads, and the effects of existing roads and proposed OHV trails are similar.

Road widths vary from 14 to 35 feet depending on single or double lane and maintenance of right of way. For trails, effects are less than roads regarding direct alteration of habitat as the width of the footprint for motorcycle trails would be 24 inches wide; ATV trails would be 50 inches wide; and jeep trails would be 80 inches wide.

General effects to wildlife include altered reproductive success, mortality, loss of habitat or habitat quality due to:

- Access for predators and people
- Fragmentation of habitat patches
- Behavioral changes in response to human use
- Impacts due to noise
- Physical alteration of habitat

Access for predators and people

Roads may act as barriers for some species but may aid in the dispersal of other native and non-native species. Pocket gophers have extended their ranges by traveling on roads and canals (Hey 1941 in Ouren et al. 2007). Brown-headed cowbirds are attracted to trails giving them easier access to parasitize nests near the trail or roads (Hickman 1990). Studies have found predation rates increase with decreasing distance to trails by raven, domestic dogs, mice, squirrels, skunks, and coyotes (Miller and Hubbs 2000; Miller et al. 1998).

Roads and trails provide greater human access to habitats previously not accessed (Forman et al. 2003). There is increased human access to and contact with animals resulting in intentional or accidental harm or mortality. Roads and trails also increase access for falconers to remove young raptors from nests (Erdman et al. 1998 in Gaines et al. 2003). Increased contact can result in increased intentional or accidental killing of wildlife, resulting in increased vulnerability of species like mink, marten, deer and elk (Cole et al. 1997; pers. comm. ODFW; Gaines et al. 2003).

Edge effect from roads and trails may also increase predation access to songbird nests. Studies found an increase in predators attracted to the corridors and the adjacent forest interior on trails and roads 7 to 26 feet (Rich et al. 1994 in Ouren et al. 2007; Hickman 1990). In addition, open areas such as junctions, play areas, campgrounds, and staging areas have perches and a clear view of surrounding areas can be a factor in higher nest predation (Ratti & Reese 1988 in Paton 1994).

Adjacent roads and trails provide travel corridors into forested habitat from nearby areas (Small and Hunter 1988; Askins 1994 in Montana TWS 1999). Predators such as great gray owls and red-tail hawk take advantage of forest edge. Roads and 4 wheel drive trails provide additional nesting habitat for these species. Indirect effects would include competition with other predators, such as Goshawk and Coopers hawk.

In recent years there have been few restrictions to cross country travel across the Forest except in designated areas (e.g. wilderness, research natural areas, Travel Management Areas, Roadless Areas). These designated areas have closure orders that prohibit cross country travel and are classified as closed on the maps and in the analysis. In closed areas, just those acres associated with roads and the road effect distance bands were considered disturbed and/or of decreased habitat quality. Closed roads have administrative use allowed. This use is highly variable in any given year from short-term daily use for a vegetation management project to years of inactivity. Because of the variability and high degree of inactivity these roads are not included in the disturbed habitat analysis. Outside of closed areas cross country travel has been permitted on Ochoco National Forest, and many miles of user created trails, closed roads, non-motorized trails and other unauthorized routes are receiving motorized use. Within the analysis area there are 659 miles of roads that are legal for mixed use by OHVs. In addition there are 140 miles of open road that are not legal for OHV use, and 669 miles of closed roads, many of which are receiving OHV use. Given the traditional pattern of "open unless designated closed" on this forest, there are currently large areas with high levels of human disturbance and predator access.

The Ochoco Summit project does not propose to construct any new roads. Proposed trail construction would utilize roads, user-created trails, fire lines, snowmobile trails, and other areas disturbed from management activities wherever possible. Through the action alternatives, OHV use would only be allowed on designated trails, routes, shared use roads and/ or play areas, and would no longer be permitted on user-created trails. Within each action alternative, there is a proposal to decrease habitat disturbance by closing and rehabilitating user-created trails, physically closing roads that are not managed as open roads, and converting roads into trails. Table 91 displays the length of trail by existing disturbance type. "Miles of trail not on roads" includes new routes, as well as routes on existing disturbance that are not recognized in GIS as Forest System Roads (ie. temporary roads, skid roads, user created trails, or old roads that have been removed from the transportation database). A combination of rehabilitation of unwanted user created or unauthorized routes and reinforcement of existing road closures would be implemented, which should ameliorate effects of human access across the analysis area. However, closed roads, converted trails and rehabilitated routes may still provide access for predators. Given the relatively open travel conditions present across much of the analysis area for hunters and predators alike, it is assumed that animal mortality rates would be similar to what currently exists.

Table 91. Comparison of Alternative Actions.

Alternative	Miles of mixed use (OHV legal) road	Miles of trail route on open roads	Miles of trails on closed roads	Miles of trails on decommissioned roads	Miles of trails not on roads
Alternative 1	659	0	0	0	0
Alternative 2	659	46	44	11	69
Alternative 3	659	13	30	7	50
Alternative 4	659	53	62	14	81

Fragmentation of habitat patches

Roads contribute to forest fragmentation by dissecting large patches into smaller patches. Forest fragmentation results in decreased interior forest habitat and increased edge habitat (Askins et al. 1987; Small and Hunter 1988; Schonewald-Cox and Buechner 1992; Askins 1994 in Montana TWS 1999; Reed et al. 1996). Patch size and distribution can determine the probability that a patch may be occupied (Laan and Verboom 1990; Fahrig 1998 in Montana TWS 1999). Habitat fragmentation from roads and 4-wheel-drive trails may reduce a species capacity by disrupting

continuous forest cover and reducing space needed by interior species (Hickman 1990 in Montana TWS 1999, Hutto 1996). However, some species such as flycatching birds and accipiters may respond favorably to canopy gaps and corridors, which they utilize as foraging sites or flyways.

Riparian areas are usually areas of high diversity. Fragmentation of riparian habitats by roads may create greater impacts on the landscape. Patch size is reduced and roads may separate important habitat associations between the uplands and riparian areas. Songbirds, such as the brown creeper and dark-eyed junco, utilizing both the riparian and upslope forested habitat (McGarigal and McComb 1992) used habitats more effectively when they were connected (Hutto 1995).

Road and trail edges may serve as ecological traps for some species (Andrews 1990 in Ouren et al. 2007; Kokko and Sutherland 2001). These areas may have the necessary resources for species to live and potentially reproduce but impose high mortality rates. For example, some bird species are attracted to roadsides due to the lush vegetation for nesting and foraging; although the road and trail sides contains suitable habitat, these individuals are at greater risk of mortality of being hit by vehicles or predation (Clark and Karr 1979 in Ouren et al. 2007, Brooks and Lair 2005; Mumme et al. 2000 in Ouren et al. 2007; Yahner et al. 1979 in Ouren et al. 2007; Kokko and Sutherland 2001). In the Ochoco Summit project area, the more likely potential effect would be increased predation, as risk of animals being hit by an OHV on trails designed for slow speed is low.

Forman (2000) described a “road effect distance” of 200 meters (660 feet) for secondary roads to calculate the indirect loss of habitat and the displacement of many species. Forman also mentions the road effect zone is highly variable and is dependent on the species affected, adjacent habitat, road type, and traffic volume. Noss and Cooperrider (1994) report edge effects are not linear and the zone varies in width depending on what is being measured. They report edge effects seen as far as 240 meters. Therefore, the 200 meter road effect distance would be used to assess edge effects as well. This distance may over-estimate effects for some species and would under-estimate effects for others. However, this distance captures known effects for many species and provides a relevant measure of change between the existing condition and the alternatives. The analysis would also assume a 200 meter affected distance for all motorized trails proposed as part of the Ochoco Summit OHV system. It is assumed that the 200 meter road effect distance would also include those effects for motorized access for dispersed camping. Vehicles accessing dispersed campsites are usually traveling at a very low rate of speed for short distance (no more than 300 feet). Engines are only on for short periods of time and therefore, effects realized for the 200 meter road effect zone would include those for motorized access for dispersed camping as well. This 200 meter road effect distance would be referred to as disturbed habitat in the analysis.

For an estimate of acres affected due to fragmentation of habitat by the network of existing open roads and by the proposed activities refer to the column labeled “Acres within 660’ (200m)” in Table 92.

Table 92. Comparison of Alternatives, Acres within distance bands of motorized routes.

Alternative	Acres within 660’ (200m)	Acres 660’ to ¼ mile	Acres ¼ mile to ½ mile	Acres ½ mile to ¾ mile	Acres ¾ mile to 1 mile
Alternative 1 (existing condition)	115,127	70,793	66,473	26,794	11,614
Alternative 2	125,745	70,192	61,299	23,450	10,484
Alternative 3	123,036	70,652	62,775	24,142	10,565
Alternative 4	129,390	70,155	58,977	22,224	10,423

Behavioral changes in response to human use

A major short-term or immediate response of wildlife to recreation is a change in behavior. Behavioral changes include stopping foraging until the disturbances ceases, fleeing, flushing, nest abandonment, and stopping mating calls (Knight and Cole 1995; Taylor and Knight 2003). Frid and Dill (2002) suggested human-caused disturbance (e.g. walking, motorized vehicles, wildlife viewing) is a form of predation risk, in that animals respond to human activities in the same way they might respond to their predators. A human approaching straight towards an animal may trigger a flight response (Bennett and Zuelke 1999; Klein et al. 1995). In addition, if the human is off-trail, the animal may have a much stronger tendency to flee (Knight and Cole 1995; Taylor and Knight 2003).

The stress of a flight response in any animal can cause physiological changes, including increased heart rate, oxygen consumption, metabolism, respiratory rate, blood flow, body temperature and blood sugar, and decreased blood flow to skin and digestive organs (Gabrielsen and Smith in Knight 1995). These types of energy expenditures can reduce vigor and decrease energy.

Long-term disturbances can reduce overall vigor and energy. Wildlife may change their habits, including reproductive behaviors, foraging habitats, food consumption, food sources, foraging areas and home ranges (Giest 1978; Klien 1971; Knight and Cole 1995). Elk have been found to avoid open roads, while deer avoid areas occupied by elk. Thus the presence of open roads can result in spatial partitioning in response to distance from motorized routes (Wisdom, et. al 2005). Some species become habituated to human presence; habituation can result in reduced sensitivity to disturbance, but may increase vulnerability to hunting or poaching.

Impacts due to noise

For the purposes of this analysis, noise is defined as any "human made sound that alters the behavior of animals or interferes with their normal functioning" (Bowles in Knight and Gutzwoulder 1995). The potential effects of noise on wildlife (AMEC 2005, Forman and Alexander 1998) include:

- Altered behaviors
- Hearing loss and decreased sound sensitivity
- Communication confusion
- Habitat loss
- Habituation

The impacts of these effects may include reduced reproductive success, mortality, and/or reduced habitat quality or habitat loss (AMEC 2005). An animal's sensitivity to sound varies with the frequency band to which it is most sensitive to (AMEC 2005). Sound is usually measured in decibels (dB) and can vary with distance from the source due to a variety of factors like topography, weather, features that act as barriers (trees), volume, and the source (AMEC 2005). Noise emitted from many OHVs today can reach 101.1 dBs and higher (http://www.fs.fed.us/r6/centraloregon/recreation/cohvops/sound.shtml). In Oregon there is a state law of 99 dBs maximum (at 20 inches from the muffler) on all OHVs (http://www.nohvcc.org/IMAGES/ohvregs.htm).

Altered Behaviors: Behavioral responses to noise can be mild, (wariness, walking slowly away, freezing, or crouching), moderate (running away, hiding in dens or burrows, flying short distances) to intense (panic flight, urinating or defecating and running at high speeds). These behaviors interrupt foraging, nurturing young, and in the case of panic responses can lead to injury or death (Bowles in Knight 1995). Burger and Gochfeld (1991) found shorebirds' foraging time decreased and avoidance of disturbance increased within 100 m (328 ft). Various mammal

studies have shown mammals may leave an area where noise is, but return at some point once the noise is gone (Bowles in Knight 1995).

Hearing loss and decrease in sound sensitivity: Although sounds from OHVs are not the loudest sounds, they are emitted more frequently in wildlife habitats than other high intensity sounds (Brattstrom and Bondello 1983 in Ouren et al. 2007). Effects on animals can vary from partial deafness to hormonal stress responses, depending on loudness and proximity.

Marler et al. (1973) used sound pressure of 95-100 decibels (dB), which represents many OHV sound levels (two stroke engines: 70-101 dB; four stroke engines: 60 dB; ATVs: 78 dB; snowmobiles: 75 dB). The noise level of 99 dB (highest allowed in Oregon) would be loud enough to create partial deafness in canaries and songbirds (Marler et al. 1973; Konishi 1969). Wildlife within the project area would not experience this noise level at a constant rate, nor would they receive this sound level 20 cm away. It is more probable wildlife would be intermittently exposed to vehicles producing sound levels of 99 dB, with a rare occasion of illegal engine reaching above 99 dB, and much farther away than 20 cm. So, while deafness is unlikely there could be a decreased sensitivity. For example, sand lizards and kangaroo rats exposed to playback recordings of dune buggies at lower decibels than they would have been actually exposed to experienced hearing loss for weeks after and were unresponsive to predator sounds (Brattstrom and Bondello 1983 in Ouren et al. 2007).

Communication Confusion: Human-made noise has the potential of interfering with animal communication signals, sounds animals listen to for orientation, and for predator-prey detection (Erbe et al. 1999 in AMEC 2005). Noisy environments can cause problems with intra-species communication and can interfere with detection, discrimination, and localization of appropriate signals (Wollerman 1998 in AMEC 2005). Klump et al. (1984) showed how the great tit can hear the sparrow hawk coming and gives one of three alarm calls to warn others of the presence of sparrow hawks. Communication between the species fails if noise masks either the noise produced from the sparrow hawk or the alarm call. Reijen and Foppen (1994) stated that where primary song was affected by vehicle disturbance, birds appeared reluctant to establish nesting territories. This could affect populations whose numbers are already low (AMEC 2005). Konish (1970) found all birds could hear frequencies below 1kHz, which may be used to detect low broad-band noises by predators. Vehicle noise may indirectly cause mortality by eliminating a species' ability to detect and capture necessary food items or detect and avoid predators (Montana TWS 1999). In addition, ambient (background) noise affects the distance at which vocalizations, human-made noises, and other sounds can be detected (AMEC 2005). Ambient noise in terrestrial environments includes sound like animal calls and songs (e.g. birds, frogs, and insects), water, and wind (AMEC 2005). At times, OHV noise may simulate natural sounds (e.g. thunder) to which animals are adapted and result in inappropriate responses. In a study conducted by Brattstrom and Bondello (1983 in Ouren et al. 2007), spadefoot toads subjected to taped motorcycle sounds emerged prematurely from their burrows during the wrong season (absence of rain).

Habitat Loss: Habitat loss is a potential impact of noise disturbance on wildlife. Studies on ungulates and carnivores have shown heavily traveled roads are avoided or used little in comparison to lightly traveled roads (Forman et al. 2003; Rowland et al. 2005). Large mammals tend to have lower population densities within 100-200 meters of roads and other animals seem to avoid roads (i.e. arthropods, small mammals, birds) (Forman and Alexander 1998; Barton and Holmes 2007; Eigenbrod et al. 2007; Fletcher et al. 1999; Montana TWS 1999; Gaines et al. 2003; and Ouren et al. 2007).

Many studies show breeding birds near highways and OHV trails have reduced densities, population decline and/or are more likely to abandon their nest (Forman et al. 2003; Barton and

Holmes 2007; Montana TWS 1999; Kaseloo 2006; Van der Zande et al.1980; Reijnen et al. 1995; Reijnen and Foppen 1995). Depending on the species the amount of habitat lost due to noise varies.

Habituation: Some animals do show the ability to adapt to noise. Flushing distance may decrease, avoidance distances may decrease, and individual wildlife may learn to ignore the sound (Bennett and Zurlke 1999; Burter 1981; Zande et al. 1980; Dorrance et al. 1975; Richins and Lavigne 1978; Moen at al. 1982 in Zielinski et al. 2007). Additionally, some songbirds can become habituated to certain people visiting their nest sites and may become aggressive to others they have not become accustomed to (Knight 1995). Mule deer were found to use areas closer to roads at Starkey Experimental Forest and Range (Johnson, 2000), but this pattern of use was attributed to avoidance of elk rather than selection of habitat near roads. Preisler (2006) noted that the response of elk to human disturbance lessened after a few days of disturbance and suggested that the elk had either habituated or found refugia close to roads, rather than fleeing to the far corners of experimental pastures at Starkey Experimental Forest and Range.

Whittaker and Knight (1999) stated that animals may become habituated to trail recreation because the movement is always occurring on a certain line of travel continually. Their study illustrated an animal's probability of flushing due to recreation increased when the activity was off-trail verse on-trail. Other studies have shown animals are also more prone to habituate to trail activities versus those activities that are unpredictable (MacAurthur et al. 1982; Miller et al. 2001). The energetic cost for wildlife of responding to disturbances from recreation can also affect the carrying capacity of wildlife habitat (Stalmaster 1983). In some cases, wildlife may habituate to predictable disturbance from recreation, but in other cases they may not (Taylor and Knight 2003). However, habituation may lead to attraction, which could have wildlife consequences. For example, habituated wildlife may be more susceptible to mortality from poaching and hunting (Singer 1975).

Disturbance associated with noise is assumed to be greatest within the road effect zone (200 meters each side of roads) as well as along unauthorized routes and via cross country travel. Disturbance would decrease beyond the road or motorized trail effect zone for each of the action alternatives and as a result, habitat quality would increase as distance from road or trail increases. Acreage within five potential disturbance bands is displayed in Table 92. At 1 mile of more from a motorized route noise and disturbance impacts are assumed to drop to the ambient level (zero impact from motorized use of the route); Table 93 displays the acreage in the project area that is within one mile of an existing or proposed route, and the acreage that is more than one mile from existing or proposed routes.

Table 93. Acreage within and more than one mile from motorized routes in the Ochoco Summit project area.

Alternative	Total Acres (% of area) less than 1 mile from motorized route	Total Acres (% of area) more than 1 mile from motorized route
Alternative 1	290,802 (96.4%)	10,779 (3.6%)
Alternative 2	291,170 (96.5%)	10,411 (3.5%)
Alternative 3	291,170 (96.5%)	10,411 (3.5%)
Alternative 4	291,170 (96.5%)	10,411 (3.5%)

Physical Alteration of Habitat

Effects of direct habitat alteration depend on the scale at which they occur and the tolerance of the species in question. Reducing one acre of habitat for a species that has a large home range and large quantities of habitat available would have very little impact, if any, on that species. Reducing one acre of habitat on a species that is not mobile and has a three acre home range may affect that individual's ability to successfully reproduce or survive. Affecting one or a few such individuals may have little or no effect on the population or species across the landscape.

This project would not remove substantial amounts of dead and down wood, would have limited landscape level impacts to various plant associations, and would avoid springs, bogs and other unique habitat. Thus, this project is not expected to result in changes to habitat for species that use dead and down logs (including bears, American marten and other species); a wide range of species that use various plant communities; and species that use springs, bogs and other unique habitat (including shorebirds, waterfowl, gastropods, amphibians and a variety of other species).

Alternative 1: Physical effects to special habitats (SHAB) such as meadows, riparian woodlands, shrublands and rocky sites would continue within the affected zone along open roads. No physical closure of unauthorized routes would be implemented. Direct and indirect effects of existing open roads are related to road maintenance activities, dust, run-off and vehicles being driven off the road surface for various reasons such as campsite access, firewood cutting, parking, etc. There would be no effects from a designated trail system.

Action Alternatives: Direct and indirect effects would continue within the road effect zone on roads that remain open and for any additional length of motorized route included in the OHV trail system described in each alternative. Direct and indirect effects include those described above for Alternative 1, as well as for soil disturbance associated with new trail construction, maintenance and conversion of old road beds to motorized trails.

Alternative 2: Within the designated trail system approximately 36 miles of designated route impact 18 acres of special habitat. Of the designated route miles on SHAB, 11 miles are on open roads. The designated system would include 126 miles in forested plant association groups (PAGs) and 44 miles in PAGs other than forested (juniper woodland, juniper steppe, non-forested). Of the designated route miles in forested PAGs: 11miles of class I routes are on open roads; 16 miles of class II routes are on open roads; and 3 miles of class III routes are on open roads. If an average width of 10' of impact to vegetation is assumed on routes not on existing roads, then approximately 1.2 acres per mile could be affected by direct habitat alteration of forested PAGs, a total of 115 acres. Of the route miles in PAGs that are not forest land, 3 miles of class I routes are on open roads; 13 miles of class II routes are on open roads; and 1 mile of class III routes are on open roads. If the same average width of habitat alteration is assumed as in forested PAGs, then non-forested habitat alteration could potentially affect 32 acres. The area impacted by clearing could be reduced in the long-run on routes where roads are converted to trails (up to 55 miles), as well as where unauthorized routes are closed. Such closures are proposed on a total of 209 sites.

Alternative 3: Within the designated trail system approximately 17 miles of designated route impact 7 acres of special habitat. Of the designated route miles on SHAB, 5 miles are on open roads. The designated system would include 82 miles in forested plant association groups (PAGs) and 19 miles in PAGs other than forested (juniper woodland, juniper steppe, non-forested). Of the designated route miles in forested PAGs 4 miles of class I routes are on open roads, and 6 miles of class III routes are on open roads. If an average width of 10' of impact to vegetation is assumed on routes not on existing roads, then the area potentially affected by direct habitat alteration of forested PAGs would be a total of 86 acres. Of the route miles in PAGs that are not forest land, 1 mile of class I route is on open roads, and 4 miles of class III routes are on open

roads. There are no class II routes proposed under this alternative. If the same average width of habitat alteration is assumed as in forested PAGs, then non-forested habitat alteration could potentially affect 17 acres. The area impacted by clearing could be reduced in the long-run on routes where roads are converted to trails (up to 37 miles), as well as where unauthorized routes are closed. Such closures are proposed on a total of 145 sites.

Alternative 4: Within the designated trail system approximately 40 miles of designated route impact 22 acres of special habitat. Of the designated route miles on SHAB, 14 miles are on open roads. The designated system would include 164 miles in forested plant association groups (PAGs) and 48 miles in PAGs other than forested (juniper woodland, juniper steppe, non-forested). Of the designated route miles in forested PAGs: 24 miles of class I routes are on open roads; 6 miles of class II routes are on open roads; and 7 miles of class III routes are on open roads. If an average width of 10' of impact to vegetation is assumed on routes not on existing roads, then the area potentially affected by direct habitat alteration of forested PAGs would be a total of 152 acres. Of the route miles in PAGs that are not forest land, 10 miles of class I routes are on open roads; 5 miles of class II routes are on open roads; and 1 mile of class III routes are on open roads. If the same average width of habitat alteration is assumed as in forested PAGs, then non-forested habitat alteration could potentially affect 38 acres. The area impacted by clearing could be reduced in the long-run on routes where roads are converted to trails (up to 76 miles), as well as where unauthorized routes are closed. Such closures are proposed on a total of 277 sites.

Threatened, Endangered and Sensitive Species

Greater Sage Grouse and California wolverine, both candidate species, are the only terrestrial wildlife species federally listed or under review for listing under the Endangered Species Act that are likely to occupy any portion of this project area based on the 2011 R6 Regional Forester's Threatened, Endangered and Sensitive Species List (R6 TES List).

Sensitive species were analyzed using the 2011 update to the R6 TES List. Table 81 includes all terrestrial animal species documented or suspected to occur on the Ochoco National Forest and their status.

Species classified as sensitive by the Forest Service are to be considered by conducting biological evaluations (BE) to determine potential effects of all programs and activities on these species (FSM 2670.32). The BE is a documented review of Forest Service activities in sufficient detail to determine how a proposed action may affect sensitive wildlife species. Columbia spotted frog, western ridged mussel (bivalve mollusk), Columbia clubtail (dragonfly), *Namamyia plutonis* (caddisfly), Harney Basin duskysnail, Indian Ford juga and Crater Lake tightcoil (snails) occupy aquatic or semi-aquatic environments and are discussed in the aquatic species section.

Table 94. Regional TES Terrestrial Animal Species for the Ochoco National Forest.

Species	Listing Status	Habitat	Presence Within Ochoco Summit Area
Bald Eagle (*Haliaeetus leucocephalus*)	Regional Forester Sensitive	Lakes, Reservoirs, Large Trees for Nesting	Habitat Present - Known Nests
Upland Sandpiper (*Bartramia longicauda)*	Regional Forester Sensitive	Large Wetlands	Habitat Present – historic occurrence
Bufflehead (*Bucephala albeola*)	Regional Forester Sensitive	Mountain Lakes and Ponds	Habitat Present - Migratory

Table 94. Regional TES Terrestrial Animal Species for the Ochoco National Forest.

Species	Listing Status	Habitat	Presence Within Ochoco Summit Area
American Peregrine Falcon (*Falco pergrinus anatum*)	Regional Forester Sensitive	Lakes, Rivers, Snags	Habitat Present - Unknown
Tricolor Blackbird (*Agelaius tricolor*)	Regional Forester Sensitive	Marshes and Bogs with Emergent Plants	No Habitat
Lewis' Woodpecker (*Melanerpes lewis*)	Regional Forester Sensitive	Open Forests, Burned Forest or Cottonwood Galleries	Habitat Present – Documented occurrence
White-Headed Woodpecker (*Picoides albolarvatus*)	Regional Forester Sensitive	Ponderosa Pine or Mixed Conifer Forests Dominated by Ponderosa Pine	Habitat Present – Documented occurrence
Greater Sage Grouse (*Centrocercus urophasianus phaeios*)	Federal Candidate	Sagebrush Without Tree Cover	Habitat Present – Documented occurrence
California Wolverine (*Gulo gulo*)	Federal Candidate	Mixed Forest Mosaic, High Elevations	Habitat Present – Historic occurrence
Pygmy Rabbit (*Brachylagus idahoensis*)	Regional Forester Sensitive	Sagebrush with Friable Soils	No Habitat
Townsend's Big-Eared Bat (*Plecotus townsendii*)	Regional Forester Sensitive	Roost Sites in Buildings, Caves and Bridges	Habitat Present – Documented occurrence
Silver-Bordered Fritillary (*Boloria selene*)	Regional Forester Sensitive	Wet meadows, marshes, bogs and more open parts of shrubbier wetlands	Habitat Present – Documented occurrence
Johnson's Hairstreak (C*allophrys johnsoni*)	Regional Forester Sensitive	Mostly in old growth coniferous forests with mistletoe presence	Unknown

After a review of existing records, habitat requirements, and existing habitat components, it was determined that the following sensitive species have habitat present in the project area or are known to occur and would be included in this analysis: Greater Sage Grouse (*Centrocercus urophasianus phaeios*), Northern bald eagle (*Halaieetus leucocephalus*), Upland Sandpiper (*Bartramia longicauda*), Bufflehead (*Bucephala albeola*), American Peregrine Falcon (*Falco pergrinus anatum*), Lewis' woodpecker (*Melanerpes lewis*), White-headed woodpecker (*Picoides albolarvatus*), California wolverine (*Gulo gulo*), Townsend's Big-Eared Bat (*Plecotus townsendii*), Silver-bordered fritillary (*Boloria selene)* and Johnson's hairstreak (*Callophrys johnsoni*).

The following species were determined not to occur in the project area based on a review of habitat requirements, and habitat types present in the project area and a lack of existing sighting information: tricolored blackbird (*Agelaius tricolor)* and pygmy rabbit (*Brachylagus idahoensis).* These species will not be included in any further analysis for this project.

American Peregrine Falcon (Falco pergrinus anatum), R6 Sensitive

In Oregon peregrine falcons occur as resident and migratory populations. They nest on cliffs greater than 75 feet in height and within one mile of some form of water (Pagel 1992). Nesting occurs in xeric areas of eastern Oregon, marine habitats of western Oregon, montane habitats to

6,000 feet elevation, small riparian corridors statewide, and more recently urban habitats of the lower Willamette and Columbia Rivers. Riparian corridors are used for travel and as hunting areas (90-95 percent of all prey items are birds that may come from these systems, Pagel 1992).

Existing Condition: There are no known peregrine falcon eyries on Ochoco National Forest. Within the Ochoco Summit OHV analysis area there is a limited amount of suitable cliff habitat that could function as nesting habitat. Cliffs in the area are considered to have low potential to support nesting peregrine falcons. In the analysis area general observations of peregrine falcons were recorded near Duncan Butte in May of 1978 and near Buck Point in July of 2002. Additional records occurred on private land between 1986 and 1995 approximately 3 miles south of the analysis area's southeast corner, one in July and three in January.

Effects Common to All Alternatives: Cliff habitat and potential foraging areas would not be modified by any alternative proposed by this project. There are no proposed trails or staging areas within 1 mile of the closest sighting location.

Determination: Implementation of any alternative would have "**No Impact**" on the peregrine falcon. Because no effects are anticipated, there are no cumulative effects.

Greater Sage-Grouse (Centrocercus urophasianus phaeios), Federal Candidate

Greater sage grouse are found in foothills, plains, and mountain slopes where sagebrush is present and the habitat contains a mixture of sagebrush and meadows in close proximity. Winter habitat containing palatable sagebrush probably is the most limited seasonal habitat in some areas (NatureServe 2008). In Oregon sage-grouse occur in Central and Southeastern Oregon in the Western and Northern portions of the Great Basin (USFWS, 2012).

Existing Condition: While this habitat type and sage grouse are known to occur on the Ochoco National Forest, this habitat type does not occur in large enough patches to provide high quality nesting and brood rearing habitat within the project area. Numerous records exist for sage-grouse sightings within 1 to 6 miles of the southeast boundary of the analysis area. These were all general sightings and most occurred between July and October. However, two springtime records occurred, both outside the analysis area by at least 3 miles. Core area has been mapped along the southeast corner of the analysis area (ODFW 2012).

Effects Common to All Alternatives: Some relatively small patches of potentially suitable nesting or brood rearing habitat occur in proximity to proposed trails. However, these sagebrush habitat patches are not likely to be utilized by nesting sage-grouse hens due to the presence of raptor perches (small patches or intermixed scab/stringer habitat) and distance from known leks (breeding sites). There are no proposed trails or staging areas within 4 miles of sighting locations, within the core area or within four miles of any known lek.

Determination: The Deschutes and Ochoco National Forests completed a Joint Aquatic and Terrestrial Programmatic Biological Assessment For Federal Lands within the Deschutes and John Day River Basin's Administered by the Deschutes and Ochoco National Forests in August 2006. At the time of document completion, the greater sage grouse was still under review for federal listing. Current direction is to continue to incorporate the Project Design Criteria (PDCs) to limit effects to sage-grouse. The PDCs for the sage grouse were reviewed in relation to the Ochoco Summit OHV project as proposed and were determined to be consistent. Implementation of any alternative would have "**No Impact"** on the western sage-grouse. Because no effects are anticipated, there are no cumulative effects.

Townsend's Big-Eared Bat (Plecotus townsendii), R6 Sensitive

Townsend big-eared bat maternity and hibernation colonies are typically in caves and mine tunnels. They roost almost exclusively in cavity roosts, both in human-made structures (that is,

buildings, bridges, and mines) and caves (Christy and West 1993). They are extremely sensitive to disturbance while roosting, because they hang directly from the ceiling of the roost and do not go into torpor (temporary hibernation) during the day in summer colonies (Barbour and Davis 1969 and Dalquist 1948 cited in Christy and West 1993). Perkins and Levesque (1987) estimated the Oregon population at 2,300-2,600 bats and Gaines (1997 cited in NatureServe 2008) estimated 3,000-5,000 individuals in Oregon. The species range extends from southwestern British Columbia, western Washington, western and central Oregon, and northwestern and west-central California. NatureServe (2009) gives them a status of S2, Imperiled in the state of Oregon. The greatest threat to the species is vandalism and disturbance by humans. Disturbance of a nursery colony or of a hibernating group is likely to cause the bats to abandon the site and move to an alternate roost. An additional threat is blockage of cave/mine entrances through collapse or human activities (NatureServe 2009).

Existing Condition: Though there are mines on Lookout Mountain Ranger District and there are documented reports of Townsend's big-eared bats occurring on the district, these are not located in proximity to any proposed trail or staging area. There is one known location for Townsend's big-eared bat in the analysis area. This location was first recorded in 1998 and is known to have continued occupancy by bats, though species determinations have not been confirmed in recent years. Another record, about 1 ½ miles west of the analysis area, came from a bat survey conducted in June of 1997.

Effects Common To All Alternatives: Cave, mine and existing wooden structures (potential roost sites) and potential foraging areas would not be modified by any alternative proposed by this project. There are no proposed trails or staging areas within 5 miles of the roost location.

Determination: The selection and implementation of any alternative would have "**No Impact**" on the Townsend's big-eared bat. Because no effects are anticipated, there are no cumulative effects.

Northern Bald Eagle (Haliaeetus luecocephalus), R6 Sensitive

The northern bald eagle was officially de-listed as a federal threatened species on August 8, 2007; however, they are still protected under the Bald and Golden Eagle Protection Act of 1940. This law provides for the protection of bald and golden eagles by prohibiting the take, possession, sale, purchase, barter, offer to sell, transport, export or import, of any bald or golden eagle, dead or alive, including any part, nest, or egg, unless allowed by permit (16 U.S.C. 668(a); 50 CFR 22). The U.S. Fish and Wildlife Service (2007) has prepared Bald Eagle Management Guidelines to help landowners, land managers, and others to meet the intent of this Act. In addition, monitoring of selected bald eagle nest sites would continue to occur including sites on national forest system lands. The Land and Resource Management Plan (LRMP) also provides direction for the management of habitat through the protection of known nest and roost sites. The designation of Bald Eagle Management Areas (BEMAs) has occurred at known nest sites subsequent to publication of the LRMP.

A detailed account of bald eagle habitat requirements can be found in the Pacific Bald Eagle Recovery Plan (USDI 1986). Bald eagle nesting territories are normally associated with lakes, reservoirs, or rivers. Nests are usually located in large conifers in uneven-aged, multi-storied stands with old-growth components (Anthony et al. 1982). Nest trees usually provide an unobstructed view of the associated body of water. Live, mature trees with deformed tops are often selected for nesting. East of the Cascade Mountains in Oregon, bald eagles prefer nesting in ponderosa pine trees that average 46 inches in diameter (range 21-76 inches) and tend to be larger than the surrounding trees (Anthony et al 1982).

Existing Condition: Within the Ochoco Summit project area there are three designated BEMAs and two mapped bald eagle winter roost areas. The bald eagle observations that have been documented in the project area are associated with established nesting territories or roost sites.

Table 95 displays the results of nesting surveys conducted in the analysis area by Frank Isaacs (Isaacs and Anthony 2008) and by district personnel over the last 10 years. Nesting surveys that contribute to post de-listing monitoring data were conducted through 2012.

Table 95. Bald eagle territories and historical nesting status 2002-2012 within Ochoco Summit project area.

Territory Name	Status 2012	Status 2011	Status 2010	Status 2009	Status 2008	Status 2007	Status 2006	Status 2005	Status 2004	Status 2003	Status 2002
Shady Creek	1	1	1	oF	1	oF	O?	1	2	oF	O?
Yellowjacket	1	O?	1	_ (new)							
Rock Creek	NS	O?	_	NS	NS	NS	NS	1	2	2	oF
Wolf Creek	2	2	2	O?	2	NS	2d	1	2	2d	2
Total Young	4	3	4	0	3	0	2	3	6	4	2

compilation from Isaacs and Anthony 2006 and survey results from 2007 to 2012

Effects Common to All Alternatives: All action alternatives exclude roads in proximity to known nests and roosts from the designated OHV system of routes. None of the proposed trail system would occur within ½ mile of any known eagle nest or within any BEMA or mapped roost area.

Determination: The Deschutes and Ochoco National Forests completed a *Joint Aquatic and Terrestrial Programmatic Biological Assessment for Federal Lands* within the Deschutes and John Day River Basin Administered by the Deschutes and Ochoco National Forests in August 2006. At the time of document completion, the northern bald eagle was still federally listed as a threatened species. A new programmatic BA for 2010-2013 does not include the bald eagle since it is no longer a federally listed species. Current emphasis is to continue to incorporate the Project Design Criteria (PDCs) to limit effects to bald eagles where possible. Guidance on legal protection for bald eagles is provided in the National Bald Eagle Management Guidelines (USFWS 2007). The PDCs for the northern bald eagle were reviewed in relation to the Ochoco Summit OHV project as proposed and were determined to be consistent. The project is also consistent with the National Bald Eagle Management Guidelines (USFWS 2007). Because there would be no removal of nest trees or potential nest trees, that all motorized routes are greater than ½ mile from the known nests, and that BEMAs would not be entered with new trail construction, the determination is "**No Impact"** to the bald eagle or their habitat. Because no effects are anticipated, there are no cumulative effects.

Bufflehead (Bucephala albeola), R6 Sensitive

The bufflehead is North America's smallest diving duck. It winters throughout Oregon but is an uncommon breeder in the central and southern Cascades (Marshall 2003). The bufflehead would use tree cavities or artificial nest boxes in trees close to water. Marshall (1996) stated that human disturbance from high recreation use at Cascade Lakes and a shortage of suitable nesting cavities due to forestry practices may be having an impact on their population status. The Oregon breeding population is considered sensitive by the ODFW because of small size and limited nesting habitat (Marshall et al 2003). The Montana Chapter of the Wildlife Society conducted a review of effects of recreation on Rocky Mountain wildlife species including waterfowl. Korschgen and Dahlgren (1992) reviewed 21 journal articles on human disturbance of waterfowl and compiled and reported that waterfowl are wary, seeking refuge from all forms of disturbance, particularly those associated with loud noise and rapid movement. Activities along shorelines

such as fishing, bird watching, hiking, and traffic were noted as disturbances to waterfowl although to a lesser degree compared to rapid overwater movement and loud noise; sailing, windsurfing, rowing, or canoeing, wading, and swimming. Disturbance effects can include increased rate of nest desertion and/or reduced hatching rate, both of which can lead to a declining population.

Existing Condition: On the Lookout Mountain Ranger District buffleheads are not commonly seen. Older forested stands adjacent to the lakes may provide snag habitat for this cavity nester, but most lakes of substantial size in the analysis area have developed or dispersed campsites used during the summer months and fall hunting seasons. Thus, there is limited potential for lakes and ponds in this analysis area to provide suitable habitat for nesting bufflehead ducks. One bufflehead sighting was recorded in June of 1999 about 1 ½ miles east of the southeast corner of the analysis area, and a migrating bufflehead was observed on a borrow pit pond in the analysis areas in November of 2007.

Effects - Alternative 1: This alternative would result in no direct effects to the bufflehead because no new OHV trails or closed roads would be opened or developed within the riparian zone of lakes or ponds in the analysis area. Because of the known recreational use of closed or unauthorized routes to otherwise protected lakes and ponds during the breeding season, it is assumed the selection of this alternative may result in some level of disturbance to nesting buffleheads, if present, along the riparian zones of these small lakes. The determination is "**May Impact Individuals Or Habitat, But Would Not Likely Contribute To A Trend Toward Federal Listing Or Cause A Loss Of Viability To The Population Or Species"** of bufflehead**.**

Effects Common to All Action Alternatives: All action alternatives propose to reinforce existing closures on routes that access riparian zones of several small lakes or ponds. Overall, this would result in a reduction of motorized use within the riparian zone of these water bodies. However, all action alternatives also propose staging areas in locations with borrow pit ponds. These sites are accessed by open roads, are devoid of snags and subject to heavy recreational use and thus are not likely to provide nesting habitat for buffleheads. However, they may provide resting areas during migration. Motorized access to these ponds is generally snowed in during spring migration and seasonal restriction on the trail would also reduce disturbance during spring migration. However, the increase in use of these sites due to designation of a new trail system may reduce the capability of these ponds to provide secure stop-over sites during fall migration.

Determination: All action alternatives would reduce motorized use of several small ponds and reservoirs compared to the existing condition. However, the action alternatives may compound disturbance effects at Cottonwood Pit and Walton Sno-Park ponds. Therefore, implementation of any action alternative "**May Impact Individuals Or Habitat, But Would Not Likely Contribute To A Trend Toward Federal Listing Or Cause A Loss Of Viability To The Population Or Species"** of bufflehead**.**

Lewis' Woodpecker (Melanerpes lewis), R6 Sensitive

This woodpecker is a medium-sized bird that relies on flycatching during the spring and summer and stored mast and fruits in the fall. They breed in low numbers in open habitats along Eastern Oregon river and stream valleys. The species is most common in open habitats (e.g. burns) in and uses cottonwood galleries in the Blue Mountains (Marshall et al. 2003). Wisdom (2000) reported that burned ponderosa pine forest created by stand-replacing fires provide highly productive habitats as compared to unburned pine. They are not considered strong cavity excavators but require large snags in an advanced stage of decay that are easier to excavate. Lewis' woodpeckers would also use old cavities created by other woodpeckers. Forty-two percent of the nest trees on the eastern edge of the Mt. Hood National Forest were in ponderosa pine (typically snags) and 43 percent were in living and declining Oregon white oak. The mean diameter of nest trees was 26

inches and mean nest tree height was 41 feet (Marshall et al. 2003). Haggard and Gaines (2001) determined that the Lewis' woodpecker was most abundant in low snag density stands within a stand replacement fire study conducted on the Wenatchee National Forest in Washington. Marshall et al. (2003) reports the species is declining throughout its range possibly due to loss of suitable habitat, competition for nest holes, and the effects of pesticides.

Existing Condition: Existing district wildlife sighting records show a few observations of Lewis's woodpeckers in or near the analysis area. Woodpecker surveys conducted between 1992 and 1995 (targeting pileated, white-headed, black-backed and three-toed) did not produce any records for Lewis' woodpecker. Surveys conducted in 2008 (targeting white-headed and Lewis' woodpeckers) produced records for six other species of woodpeckers and sapsuckers, but no Lewis' woodpeckers. Records (2003 to 2007) from the local chapter of the Audubon Society (formerly East Cascade Bird Conservancy) had the majority of its Lewis' woodpecker records at lower elevations (off the Forest), during migration. However, one record included four woodpeckers in late August within the analysis area. Of the three records of Lewis's woodpeckers in the analysis area, two are more than 5 miles from any proposed trail or staging area, while the other is within 1 mile of a class III trail and about 1 mile from a class III staging area in an active gravel pit.

Effects Common To All Alternatives: Hamann et al. (1999) and Gaines et al.(2003) conducted literature reviews of recreational associated effects on wildlife including studies on woodpeckers and other cavity nesting birds. Their reviews of existing published literature showed that recreational trail-associated disturbances did not present a problem to woodpeckers and cavity nesters as a group. Hamann et al. (1999) also stated that recreational activity is unlikely to be focused around nest sites of these species and by design woodpeckers and other cavity users are relatively more secure from nest predation than any other group of forest birds. Therefore at the present, recreational disturbance is not known to be a major limiting factor.

Altman in the Landbird Conservation Strategies for the Northern Rocky Mountains (2000) lists the Lewis' woodpecker as the Focal Species for both 1) the Burned Old Foret conservation focus in the Dry Forest habitat type and 2) the Large Snags in Riparian Woodland conservation focus in the Riparian habitat type. He also lists them as a species to benefit from the presence of large patches of old dry forests. Recommendations include road closures or fuel wood restrictions to minimize the loss of large ponderosa pine snags. No snags would be intentionally targeted for felling with the exception of hazard trees or snags near trails or staging areas. Project design and layout would minimize the loss of existing large snags and this would be consistent with the recommendations by Altman (2000).

Determination: Current literature reviews state that the woodpecker guild is not known to be disturbed from recreational trail users and Project Design Features have been incorporated to minimize the intentional removal of large diameter trees and snags. The selection of any alternative would lead to a determination of "**No Impact**" on the Lewis' woodpecker. Because effects are limited to incidental loss of snag habitat on a very small proportion of the landscape in a scattered arrangement, proposed activities are not likely to substantially reduce habitat within individual home ranges or at the landscape scale. Refer to the discussion on effects to snag habitat in the section on Primary Cavity Excavators, under Management Indicator Species.

White-Headed Woodpecker (Picoides albolarvatus), R6 Sensitive

The white-headed woodpecker is a resident of montane forests from southern interior British Columbia south through Central Washington, Northern Idaho, Eastern Oregon and Southwest Oregon, Northern and Central California, and the eastern edge of Central Nevada to the mountains of Southern California (Marshall et al. 2003). The presence of old growth pine is thought to be important to white-headed woodpeckers. Large diameter pines provide bark

crevices for the invertebrate prey of white-headed woodpeckers and are good cone producers; white-headed woodpeckers rely on pine seeds for food during the winter months. Old-growths stands have greater densities of the large-diameter snags that white-headed woodpeckers appear to select for nesting (Frenzel 2002). White-headed woodpeckers usually excavate nest cavities in snags, but other recorded substrates include stumps, leaning logs, and the dead tops of live trees. Frenzel (2002) studied white-headed woodpecker nesting areas on the Deschutes and Winema National Forests; he found that nest trees ranged from 23.6 to 118.1 cm (9-46 inches) with an average diameter of 27 inches, 89 percent of the nest trees were in ponderosa pine, and canopy closure at the nest tree ranged from 0 percent to 57 percent with a mean of 13 percent.

Frenzel (2002) concluded population recruitment for this woodpecker was insufficient to offset mortality in his study areas on the Deschutes and Winema National Forests. He also reported that shrub growth, increased understory tree densities from fire suppression, may be factors affecting levels of mammalian nest predation and vulnerability of adults to avian predation. Marshall et al. (2003) stated that the long-term stability of this woodpecker in Oregon and Washington appears to rest with reversing the declining health of ponderosa pine forest.

Existing Condition: Existing district wildlife sighting records show a numerous observations of white-headed woodpeckers in or near the analysis area between 1989 and 2010. Woodpecker surveys conducted between 1992 and 1995 (targeting pileated, white-headed, black-backed and three-toed) produced many records for white-headed woodpecker, including multiple records within the analysis area. Surveys conducted in 2008 (targeting white-headed and Lewis' woodpeckers) produced records for six species of woodpeckers and sapsuckers, including white-headed woodpeckers within the analysis area (Polie Creek, Marks Creek, Ochoco Creek, Rush Creek). Ongoing survey efforts in spring/summer 2010 have recorded white-headed woodpecker responses near Polie Creek and Little Summit Prairie (both within the analysis area). In addition, records from local Audubon Society members (formerly East Cascade Bird Conservancy) from 2003 to 2007 described numerous sightings of white-headed woodpeckers, including nine in the project area from June to October in 2004 through 2006.

Effects Common To All Alternatives: Hamann et al. (1999) and Gaines et al. (2003) conducted literature reviews of recreational associated effects on wildlife including studies on woodpeckers and other cavity nesting birds. Their reviews of existing published literature showed that recreational trail-associated disturbances did not present a problem to woodpeckers and cavity nesters as a group. Hamann et al. (1999) also stated that recreational activity is unlikely to be focused around nest sites of these species and by design woodpeckers and other cavity users are relatively more secure from nest predation than any other group of forest birds. Therefore at the present, recreational disturbance is not known to be a major limiting factor.

Altman in the Landbird Conservation Strategies for the Northern Rocky Mountains (2000) lists the white-headed woodpecker as the Focal Species for the Large Patches of Old Forest conservation focus in the Dry Forest habitat type. He also lists them as a species to benefit from the presence of grassy edges and openings in dry forest. Recommendations include various measures to minimize the loss of snags, particularly soft snags, and high cut stumps for hazard tree removal. No snags would be intentionally targeted for felling with the exception of hazard trees or snags near trails or staging areas. Project design and layout would minimize the loss of existing large snags and high stumping in suitable white-headed woodpecker habitat types will be included in the design elements for this project, consistent with the recommendations by Altman (2000).

Determination: Current literature reviews state that the woodpecker guild is not known to be disturbed from recreational trail users and Project Design Features have been incorporated to minimize the intentional removal of large diameter trees and snags. These measures incorporated

into any alternative would have "**No Impact**" on the white-headed woodpecker. Because effects are limited to incidental loss of snag habitat on a very small proportion of the landscape in a scattered arrangement, proposed activities are not likely to substantially reduce habitat within individual home ranges or at the landscape scale. Refer to the discussion on effects to snag habitat in the section on Primary Cavity Excavators, under Management Indicator Species.

California Wolverine (Gulo gulo), Federal Candidate

The wolverine is the largest terrestrial member of the mustelid family with males weighing 26 to 40 pounds and females 17 to 26 pounds. Wolverines are opportunistic feeders consuming a variety of foods depending on availability. There is no evidence hunting by wolverines is limited by habitat structure. Primarily a scavenger rather than a hunter, the wolverine forages where carrion can be found (Ruggiero 1994). In addition to carrion they would also prey on small animals and birds and eat fruits, berries, and insects. Copeland et al. (2007) reported little seasonal movement (400 meter elevational band) among collared wolverines in Idaho and the modest shift was likely due to prey availability in the form of ungulate carrion at lower elevation and upslope movement to locate rodents at higher elevations in the summer.

Wolverines occupy a wide variety of habitats from the arctic tundra to coniferous forest. The most common habitats are those that contain a high diversity of microhabitats and high prey populations. Copeland (2007) described wolverine habitat in the contiguous United States as consisting of small, isolated "islands" of high-elevation, alpine habitats containing sufficient depth of snow during the denning period, separated from each other by low valleys of unsuitable habitats. Wolverines occupy habitat in a high elevation band from 6,888 feet to 8,528 feet in the mountains of the lower 48 states (Federal Register/ Vol. 73, No. 48/ Tuesday, March 11, 2008). The intervening valleys in this area range from 3,198 feet to 4,920 feet and are unsuitable for long-term wolverine habitat because they do not have the snow conditions or other habitat features required by wolverines (Aubry et al. 2007 in Federal Register/ Vol. 73, No. 48/ Tuesday, March 11, 2008). High elevation alpine wilderness areas appear to be preferred in summer, which tends to effectively separate most wolverine and human interactions. Aubry et al. (2007) reported that virtually all of the wolverine records located in the Pacific states were within or near alpine areas. Copeland et al. (2007) reported that adult males tend to travel more widely than females and as such, they are more likely found in lower, coniferous-dominated habitats simply by chance. The essential component of wolverine habitat may be isolation and the total absence of disturbance by humans (Ruggiero 1994). However, Copeland et al. (2007) reported that unmaintained winter roads used for snowmobile access to trapping sites in the study area were frequently used for travel by wolverines.

The most critical and limiting habitat for wolverines seems to be acceptable natal denning habitat. Magoun and Copeland (1998) described two types of dens used by wolverines: natal and maternal. Natal dens are used during parturition and occur more commonly in subalpine cirque basins associated with boulder talus slopes. Maternal dens are used subsequent to natal dens and before weaning occurs. They consist of a complex of dens associated with boulders or fallen trees. Magoun and Copeland (1998) believe that a critical feature of wolverine denning habitat is the dependability of deep snow to persist through the denning period of February through May with at least one meter of snow depth. Ruggiero (1994) described natal dens having been found in snow tunnels, hollow trees and even caves in the ground. Ruggierro (1994) also reported that in forested habitats the structural diversity provided by large snags, fallen logs, and stumps would likely provide natal den sites. Aubry et al. (2007) reported that virtually all of the wolverine records located in the Pacific states were within or near alpine areas. They also reported that spring snow cover was the only habitat layer in their study that fully accounted for the distribution of historical wolverine records in the western mountains.

Home ranges for adult wolverines tend to be large ranging from 38.5 square miles to 348 square miles (Banci 1994 in Federal Register Doc. 03-26475). Copeland (1996) radio collared wolverines in Idaho and reported annual home ranges of resident adult females averaged 148 square miles and an average of 588 square miles for resident adult males. Aubry et al. (2007) compiled verifiable and documented records of wolverine occurrences and suggest that the historical distribution of wolverines in the Cascade Mountain and Sierra Nevada was disjunct, contradicting previous interpretations. Current records (1995-2005) are limited to north-central Washington, northern and central Idaho, western Montana, and northwestern Wyoming (Aubry et al. 2007). A recent observation with photographs indicates wolverines are still present in California (Zielinski, pers. comm. 2008). Aubrey et al. (2007) found no current records in Oregon despite concerted efforts to obtain verifiable evidence of wolverine occurrence using remote cameras, bait stations, and helicopter surveys in many areas of the Pacific states. However, five verifiable records of wolverine presence in Oregon were documented from 1961 to 1994 (Aubry et al. 2007). Recently confirmed sightings were recorded in the Eagle Cap Wilderness.

Wolverine may be impacted by management practices that influence subalpine and alpine communities, particularly those that reduce the presence and opportunity for carrion availability (Copeland et al. 2007). Resource extraction (including timber harvesting), backcountry skiing and snowmobiling, roads and other forms of human disturbance merit careful consideration by those concerned about wolverine conservation (Ruggiero et al. 2007) Researchers in British Columbia found a consistent negative association between wolverine occurrence and areas where helicopter and backcountry skiing occur. However, the causal factors associated with these patterns are not well understood (Copeland et al. 2007). Squires et al. (2007) found that trapping was the primary factor explaining decreased survival in western Montana. He also determined that harvest pressure was capable of reducing isolated populations beyond sustainable levels despite a regulated harvest within a state-wide quota system.

Existing Conditions: District records list multiple wolverine sightings near the west end of the analysis area between 1969 and 1992. There are also multiple records near the northeast corner of the analysis area between 1975 and 1997. Between these clusters of sighting were two records along the North Fork of the Crooked River in the 1980s. Potentially suitable natal denning habitat may be found in the Bridge Creek Wilderness Area, Lookout Mountain Recreation Area and Rock Creek/Cottonwood Creek area, as well as on the talus areas on north to northeast facing slopes below Mt Pisgah, Peterson Point, the rim above Keeton and Fry Creeks, Buck Point and the rim between Buck Point and Rock Creek . It is unlikely that denning habitat would be found in remainder of the analysis area because of open roads, moderately high recreational use, and the lack of persistent snow cover in subalpine areas where denning might occur.

Effects – Alternative 1: This alternative would result in no direct effects to the wolverine because no new OHV trails or closed roads would be opened or developed which access potential denning habitat in the analysis area. However, because of the known recreational use of closed or unauthorized routes to otherwise protected talus slopes, remote high elevation areas and northeast facing basins, it is assumed the selection of this alternative may result in some level of disturbance to wolverine, if they are present, in these areas. The determination is "**May Impact Individuals or Habitat, but Would Not Likely Contribute to a Trend toward Federal Listing or Cause a Loss of Viability to the Population or Species."**

Effects Common to All Action Alternatives: The selection of any action alternative would have no effect on potential wolverine denning in the analysis area. The most suitable potential denning habitat is found in wilderness, roadless or unroaded areas, none of which are in proximity to any proposed trails or areas. High road densities, and year-round recreational use, including the designated snowmobile and Nordic ski trails, across the project area would likely preclude wolverine use of the Ochoco Summit project area as denning habitat. However, there are

occasional reports of wolverine in the analysis area, so it is possible that increased motorized route density (action alternatives) could result in disturbance to individual wolverine passing through the area. The additional impact from proposed trails would likely be negligible compared to the existing impacts from open roads and designated over-the-snow routes.

Determination: Although at the present time (November 2012) there are no recent confirmed records of wolverine presence in the analysis area there are numerous unconfirmed historic records for this species. As this animal is known to be affected by motorized use, particularly over the snow, and this project would not prohibit use of proposed routes by over the snow vehicles, the action alternatives "**May Impact Individuals or Habitat, but Would Not Likely Contribute to a Trend toward Federal Listing or Cause a Loss of Viability to the Population or Species."**

Silver-Bordered Fritillary (Boloria selene), R6 Sensitive

The silver-bordered fritillary butterfly has a holarctic range extending from northern Canada southward into the United States and as far south as New Mexico (NatureServe 2008). While the species is common and widespread in northeastern Washington and northern Idaho, colonies are extremely local and isolated southward, and are particularly vulnerable to local extinctions. Only two primary colonies are found in Oregon, one at Big Summit Prairie on the Ochoco National Forest and one in the Strawberry Mountains Wilderness on the Malheur National Forest (Miller and Hammond 2007). NatureServe (2008) lists this species as G5, demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery. In Oregon its ranking is listed as S2, Imperiled. Suitable habitat for this species is described as mostly wet meadows, marshes, bogs, and more open parts of shrubbier wetlands (NatureServe 2008, Miller and Hammond 2007). This species is dependent on the maintenance of open and wet meadow habitats (Miller and Hammond 2007). Food sources for the adults include nectar sources such as composite flowers, including goldenrod and black-eyed susans (Opler et al. 2006). Eggs are laid singly near host plants and caterpillar hosts are violets including *Viola glabella* and *Viola nephrophylla* (Opler et al. 2006).

Existing Conditions: Surveys for this fritillary species were conducted on the Lookout Mountain Ranger District in suitable habitat surrounding Big Summit Prairie between 1995 and 1998. Several sub-populations of this species were confirmed and mapped. Within the analysis area suitable habitat for this species may occur in the wet meadow complexes where tributary streams enter wet meadow or marsh areas. Riparian habitat is also present in the analysis area on private lands along the Little Summit Creek and North Fork of the Crooked River. However, it is currently unknown if suitable habitat conditions exist for this species on private lands.

Effects Common to All Alternatives: There are no proposals to develop new motorized trails or include user-created trails that access wet meadow habitat that may be providing habitat for this species of butterfly. Crossings of any meadow areas would have a hardened surface or crossing structure to prevent impacts to wetland vegetation in accordance with design criteria outlined in Chapter 2 of this document. Mitigations for botanical resources should also provide protection to reproductive habitat for this species. There are no proposed trails or staging areas within 1 mile of documented populations of this species.

Determination: The selection of any alternative would have **"No Impact"** on the Silver-bordered Fritillary butterfly. This determination is based on the premise that no suitable habitat would be negatively impacted by project activities.

Johnson's Hairstreak (Callophrys johnsoni), R6 Sensitive

The Johnson hairstreak butterfly is found from southwest British Columbia southward into the Coast Ranges to San Francisco in California; south in the Cascades and Sierra Nevada to

Yosemite and also in the Blue Mountains of eastern Oregon. In Oregon its ranking is listed as S2, Imperiled, while globally its status is G3, very rare or local throughout its range or found locally in a restricted range (NatureServe 2008).

Suitable habitat for this species is described as coniferous forests, especially old growth (Opler et al. 2006) and old growth coniferous forests with red firs, western hemlocks, or gray pines on which its parasitic (mistletoe) hosts grows (NatureServe 2008). Johnson's hairstreak is believed to feed generally on all dwarf mistletoe species throughout its range, and to perhaps specialize on locally available dwarf mistletoes in specific localities (Miller per comm. 2008 cited by Schmitt and Spiegel 2008). Miller and Hammond (2007) describe suitable habitat as almost identical to that of the northern spotted owl except that the butterfly does not occur south of central California. The caterpillar food plant is western dwarf mistletoe. Adults find nectar on low growing plants such as Oregon grape, ceanothus and pussypaws (NatureServe 2008; Pyle, 1981; and USDA, NRCS 2008). Miller and Hammond (2007) indicated that to benefit this species management practices need to promote the maintenance of mature and old-growth conifers at middle to low elevations on the west slope of the Cascade Mountains and Coast Range.

Existing Conditions: Opler et al. (2006) shows Johnson hairstreak documentation for western and central Oregon plus the Blue Mountains in northeastern Oregon. The species is suspected to occur on the Ochoco National Forest, but currently there is no confirmed documentation for this species anywhere in on Ochoco National Forest. Formal surveys have not been conducted. The species is closely associated with dwarf mistletoe which is present in the project area. However, an association of Johnson's hairstreak with the species of mistletoe present on this Forest has not been confirmed. Schmitt and Spiegel (2008) state that in the absence of recent large scale disturbance, dwarf mistletoe infestation levels can occur in early, mid, and late successional stands. Though the analysis area includes several small to moderately sized recent fire events, the project area has not experienced a large scale stand replacement event associated with an uncharacteristic wildfire. Therefore, mistletoe infection is assumed to be present in all stand age classes which could serve as a host for the caterpillar, if it occurs in association with the mistletoe present on this Forest.

Direct and Indirect Effects - Alternative 1: The selection of this alternative would not result in any change in vegetative conditions of conifer stands in the project area because no new trail construction would be completed. The species may occur in the area, but that no management action is planned that would impact the species. Thus, the determination is **"No Impact"** to the Johnson's hairstreak butterfly and their habitat.

Effects Common to All Action Alternatives: The selection of any action alternative would result in the designation of user created trails, roads converted to trails and inclusion of new trail construction. Trail widths needed for new construction would be approximately 50 inches wide for Class I machines (ATVs), approximately 80 inches wide for Class II machines (jeeps and buggies), and approximately 24 inches for Class III (motorcycles). New trails would be designed to minimize tree removal but may require trees up to six to eight inches in diameter to be cut some of which may be infected with mistletoe. Mistletoe infection, however, is considered to be widespread throughout all plant associations and size classes over much of the 301,575-acre project area. Mistletoe infection would remain widespread throughout the project area if any of the action alternatives were selected for implementation. The incidental removal of mistletoe-infected trees during construction or maintenance would have a negligible effect on mistletoe in the analysis area, and thus would have very little effect on reproductive habitat for this species. Likewise, due to the relatively small proportion of the area physically impacted during construction, maintenance and use of the trail system (refer to the Botany section), the abundance of flowering plants to serve as foraging sites for adults would not be substantially changed by the alternatives.

Determination: This species has not been documented to occur on Ochoco National Forest and formal surveys have not been conducted. Because the host species are present, this butterfly may also be present. Due to the minimal scale of mistletoe removal relative to the extensive scale of mistletoe infection, the abundance and distribution of mistletoe host brooms (reproductive habitat for this butterfly) will not be substantially changed at the landscape scale under any action alternative. Likewise, the abundance of flowering plants that could serve as foraging sites for adults would be subject to a negligible reduction. Implementation of any action alternative "**May impact individuals or habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species"** for the Johnson's hairstreak. This conclusion is based on the limited scope of this project and the narrow trail width needed for trail construction compared to the size of the analysis area and the current magnitude of mistletoe infection.

Upland Sandpiper (Bartramia longicauda), R6 Sensitive

Upland sandpipers breed in prairie-grassland habitats from Alaska and Canada to N. Dakota and adjacent states. A small, disjunct relict population occurs in Oregon and Idaho. The species winters in papas of c South America. Habitat for upland sandpiper is present in this watershed due to the inclusion of Big Summit and Little Summit Prairies and their extensive open wetland areas. According to Marshall et al. 2003, Oregon's upland sandpiper population, probably the largest west of the Rocky Mountains, is close to extirpation, and that remnant breeding populations are limited to Bear and Logan Valleys in Grant County. However, some field guides show isolated or rare occurrences in South Central Oregon and northern California (Kaufman 2000, Sibley 2000). Breeding by this species at Big Summit Prairie was reported in 1919 and a single bird was observed in that area in 1987. Continental range has been decreasing over the last two centuries due to hunting in the late 1800's, and conversion of prairie habitat to farming and grazing (White 1983). Though populations east of the Rocky Mountains are stable or increasing, populations west of the Rockies are declining and its continued existence in the Northwest is precarious (Marshall et al. 2003). Marshall et al offered as possible reasons for the western population declines the following: encroachment of pine into meadows, use of herbicides to control or eliminate forbs in nesting meadows, overgrazing in meadows especially during incubation and brood rearing, down-cutting of streams which impacts the water table and meadow systems and management practices on wintering grounds. The species currently holds rankings in Oregon as Sensitive and by the Natural Heritage program as G5 globally secure, S1 critically imperiled in Oregon.

Existing Condition: Upland sandpipers have been recorded historically at Big Summit Prairie, but no records are known from the area since 1987. The expansive wetland complex of Big Summit Prairie is largely under private ownership, with only small amounts under management by the Bureau of Land Management. The majority of the prairie habitat in Big Summit Prairie is grazed seasonally by cattle. The majority of Little Summit Prairie is also under private ownership and is grazed seasonally by cattle. It is suspected that the historic breeding population reported in the area early in the 1900's is no longer present on the prairies of the Ochoco Mountains. Surveys conducted in 1993 did not result in any sightings and there are no records of upland sandpipers in the sighting record database forest-wide.

Effects Common to All Alternatives: This alternative would result in no direct effects to the upland sandpipers or potential habitat for them because no new OHV trails, trailheads or staging areas would be developed within expansive prairie-grassland habitats in the analysis area. Crossings of any meadow areas would have a hardened surface or crossing structure to prevent impacts to wetland vegetation in accordance with design criteria outlined in the DEIS. Mitigations for botanical resources should also provide protection to reproductive habitat for this

species. There are no proposed trails or staging areas within 1 mile of documented populations of this species.

Determination: The selection of any alternative would have "No Impact" on the upland sandpipers. This determination is based on the absence of this species within the project area, and because no suitable habitat would be impacted by project activities. Because no effects are anticipated, there are no cumulative effects.

Cumulative Effects to TES Species with Habitat Present in the Project Area

Past, present and reasonably foreseeable projects which have effects that overlap in time and space with effects of this project are listed in Table 6.

As described above, due to the fact that this project does not include large scale vegetation management, there are no cumulative impacts to habitat components based on vegetative composition and structure when considered in combination with thinning and prescribed burning treatments. However, this project's effect of increased access could combine with effects of increased accessibility due to development of routes used to implement commercial thinning projects, and with the more open forest conditions created through vegetation and fuels management projects. If this occurred in proximity to occupied habitat for TES species there could be an increase in the potential for disturbance. However, there is no overlap of proposed trails or staging areas with Bald Eagle Management Areas or bald eagle roosts or nest buffers. There is no mapped critical or essential habitat, or occupied habitat for the other TES species within the zone of influence of any proposed route or staging area, with the exception of white-headed woodpecker. As noted in the section on Primary Cavity Excavators, white-headed woodpeckers prefer open forest conditions, and woodpeckers are not considered to be sensitive to disturbance from recreational activity. On the other hand, woodpecker habitat is vulnerable to illegal woodcutting. No new routes would be constructed of sufficient width to accommodate full size trucks and trailers typically used by woodcutters. Some full width roads would have their width reduced to trail standards, or would be closed under the action alternatives and thus, woodcutter access reduced. In addition, effects of project implementation on snag habitat are limited to incidental loss of snag habitat on a very small proportion of the landscape, in a scattered arrangement that is not likely to substantially reduce habitat within individual home ranges or at the landscape scale. Therefore, cumulative effects to white-headed woodpeckers are not expected to result in loss of occupied habitat and the cumulative effect on snag abundance would be negligible at the landscape scale.

The Forest-level Travel Management Plan would closed district to cross country travel except on designated routes or in designated areas. Following implementation of the forest-level Travel Management Plan acres of disturbed habitat would be limited to only those roads and motorized trails that are designated as open to the public for motorized use. Thus, the road closure reinforcements, rehabilitation of user created trails and additional road closures proposed in the action alternatives would combine with the Travel Management Plan so that disturbance would be reduced in areas distant from open roads and trails, but would be increased in proximity to the routes that are designated open.

Summary of Conclusions for Sensitive Species

1. There is no habitat present and/or the following species are not expected to occur within the project area and therefore the determination is **"No Impact"** for pygmy rabbit and tricolored blackbird.
2. The selection of any alternative (1, 2, 3 or 4) is expected to have **"No Impact"** on the bald eagle, peregrine falcon, Lewis' woodpecker, white-headed woodpecker, greater sage-grouse, Townsend's big-eared bat and the silver-border fritillary.

3. The No Action alternative would result in a determination of "**May Impact Individuals or Habitat, but Would Not Contribute to a Trend toward Federal Listing or Loss of Viability to the Population or Species"** to the bufflehead and California wolverine.
4. The No Action alternative would have **"No Impact"** on the Johnson hairstreak.
5. The action alternatives (2, 3 and 4) "**May Impact Individuals or Habitat, but Would Not Contribute to a Trend toward Federal Listing or Loss of Viability to the Population or Species"** for the bufflehead, California wolverine and Johnson's hairstreak.

Table 96. Summary of Conclusion of Effects to Region 6 Sensitive Animal Species.

Species	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Bald Eagle	NI	NI	NI	NI
Upland Sandpiper	NI	NI	NI	NI
Bufflehead	MIIH	MIIH	MIIH	MIIH
American Peregrine Falcon	NI	NI	NI	NI
Tricolored Blackbird	NI	NI	NI	NI
Lewis' Woodpecker	NI	NI	NI	NI
White-Headed Woodpecker	NI	NI	NI	NI
Greater Sage-Grouse	NI	NI	NI	NI
California Wolverine	MIIH	MIIH	MIIH	MIIH
Pygmy Rabbit	NI	NI	NI	NI
Townsend's Big-Eared Bat	NI	NI	NI	NI
Silver-Bordered Fritillary	NI	NI	NI	NI
Johnson's Hairstreak	NI	MIIH	MIIH	MIIH

NI = No Impact
MIIH = May impact individuals or habitat, but would not likely contribute to a trend toward federal listing or loss of viability to the population or species
BI = Beneficial Impact

Management Indicator Species (LRMP)

During the preparation of the Ochoco National Forest Land and Resource Management Plan (USDA 1989), a group of wildlife species were identified as Management Indicator Species (MIS). These species were selected because their well-being could be used as an indicator of other species dependent upon similar habitat conditions. Indicator species can be used to assess the impacts of management actions on a wide range of other wildlife with similar habitat requirements. The species listed in Table 97 were selected for the Ochoco National Forest.

Table 97. Ochoco National Forest Management Indicator Species.

Ochoco National Forest Management Indicator Species	Habitat	Species Present Within Analysis Area	Habitat Present Within Analysis Area
Primary Cavity Excavators	Dead wood habitat	Yes	Yes
Pileated Woodpecker	Old-growth mixed conifer forests	Yes	Yes
Northern Flicker	Old Growth Juniper	Yes	Yes
Golden Eagle and Prairie Falcon	Cliffs, talus, caves	Yes	Yes
Northern Bald Eagle	Lakeside/Reservoir, Large Trees	Yes	Yes
Rocky Mountain Elk and Mule Deer	Mosaic of early, forage-producing stages and later, cover-forming stages of forests, in close proximity	Yes	Yes

Effects to the northern bald eagle and American peregrine falcon were discussed in the Proposed, Endangered, Threatened, and Sensitive Species section, previously in this Chapter. Golden eagles and prairie falcons are discussed in the section on raptors, later in this chapter in the section titled "Other Species (LRMP)." Potential effects to the remaining MIS species are discussed in this section.

Primary Cavity Excavators (woodpeckers, chickadees and nuthatches)

Primary Cavity Excavators (PCE) include the Pileated Woodpecker and Northern Flicker (LRMP MIS), white-headed woodpecker and Lewis' woodpecker (TES and focal species), red-naped sapsucker (focal species) and other avian species that excavate their own cavities.

Primary cavity excavators are listed as a group, as Management Indicator Species (MIS) in the Ochoco National Forest Land and Resource Management Plan (LRMP). The primary cavity excavator MIS group includes birds that feed primarily on dead wood insects and that excavate their own nest cavities. Primary cavity excavators were selected to represent the species that require snag habitat, or that utilize dead or defective wood habitat that is often reduced by forest management activities. The primary cavity nesters serve as ecological indicators for a large number of species and for secondary cavity users, like swallow, blue birds and bats (FEIS pp 3-22).

The PCE species associated with the analysis area are listed below (Thomas et al., 1979). The species with an asterisk (*) are also dead wood insect users.

Pileated Woodpecker*
White-headed Woodpecker
Northern Flicker
Lewis' Woodpecker*
Williamson's Sapsucker*
Black-backed Woodpecker*
White-breasted Nuthatch*
Pygmy Nuthatch*
Red-naped Sapsucker*
Hairy Woodpecker*
Three-toed Woodpecker*
Red-breasted Nuthatch*
Downy Woodpecker*

Effects to the white-headed and Lewis' woodpeckers have been disclosed in the Threatened, Endangered, and Sensitive section of this Chapter. Effects to the black-backed, three-toed, pileated, hairy and downy woodpeckers and the red-naped and Williamson's sapsuckers, common

flicker, chickadees and nuthatches are discussed here. These species have been grouped together into the PCE. Direct, indirect, and cumulative effects are discussed for this group below.

Habitat use by woodpeckers that depend on the presence of bark beetles shows some similarities and some differences in stands selected for nesting, roosting, and foraging. Habitats for these species include lodgepole pine forests, mixed conifer, and mountain hemlock, although forest type may not be as important as the presence of bark beetles (Marshall et al. 2003). Stand-replacing fires produce habitats that briefly contain abundant food resources for woodpeckers (McCullough et al. 1998 cited in Marshall et al. 2003). After three to five years, the majority of the insects inhabiting the dead wood emerge as adults and do not re-colonize the dead trees, resulting in a decrease in food availability and hence habitat suitability for woodpeckers.

Wisdom et al. (2000) stated there are several factors affecting these species. Silvicultural practices (tree harvest before susceptibility to beetle attack) and fire management policies (salvage logging) have altered natural patterns of beetle outbreaks. Also, increasing road densities have allowed greater human access into forested regions for snag removal as firewood.

Some PCE species are dependent upon snags and/or live trees with internal rot for nesting or roosting cavities and as a forage substrate. Many of the PCE species listed above fall into this group. However, there are differences in their selection of preferred habitats. For example, the common flicker is generally most abundant in open forests and forest edges while the pileated woodpecker occurs primarily in dense mixed conifer forests in late seral stages or in deciduous trees stands in valley bottoms (Marshall et al. 2003).

The pileated woodpecker holds a ranking in Oregon as Sensitive; all of these species are ranked by the Natural Heritage program as G5 globally secure. NatureServe (2009) listed the following as the top five major threats afflicting pileated woodpeckers (1) conversion of forest habitats to non-forest habitats, (2) short rotation, even-age forestry, (3) monoculture forestry, (4) forest fragmentation, and (5) removal of logging residue, downed wood, and pine straw that would ultimately put nutrients back into the ecosystem and provide foraging substrate. The northern flicker is ranked as S5: demonstrably widespread, abundant and secure (NatureServe 2009, Csuti 1998). Other PCE species depend upon dead or defective woody materials that allow access for use of natural cavities or for excavation of cavities using existing cracks to gain entrance to hollow or decaying wood. These species will also utilize cavities left by other primary cavity excavators (sapsuckers and woodpeckers) and thus they can be used as an indicator for many other species of secondary cavity nesters. There are differences in their selection of preferred habitats. Some are more common in the mountainous areas of Central Oregon, while others tend to be restricted to riparian woodlands and lower elevation areas in eastern Oregon. Some prefer dense moist forests in comparison to others which prefer open ponderosa pine forests. For some the presence of large hollow trees and snags is important. For example to survive cold winter nights, the pygmy nuthatch goes into a state of torpor when roosting communally inside tree cavities (Marshall et al. 2003).

Existing Condition: Events affecting bark beetle abundance have occurred in the past. In 1967 to 1968 three fires burned approximately 6,100 in the Ochoco Creek and Marks Creek Watersheds, which were subsequently salvaged. The Hash Rock Fire of 2000 burned about 4,600 acres in the Marks Creek Watershed; the Maxwell Fire of 2006 burned about 6,965 acres in Upper North Fork Crooked River Watershed; the Bridge Creek fire of 2008 burned about 5,300 acres in the Bridge Creek Watershed; and the 747 Fire of 2002 burned 15,091 acre on national forest system land in Rock Creek Watershed. These are examples of wildland fires that have occurred irregularly across the analysis area and provided short-term foraging areas in the past. Potential nesting habitat is distributed in patches across the planning area as well.

Pileated woodpecker habitat in the Ochoco National Forest is defined as ponderosa pine stands with Douglas-fir and grand fir understories, or mixed conifer stands with greater than 15-20 inch in diameter trees and a dense canopy condition. Northern flickers are habitat generalists and occur throughout the analysis area, especially in open stands.

The Land and Resource Management Plan (LRMP) allocated a network of Old-growth Management Areas (OGMA) including approximately 19,570 acres across the Forest (outside of Wilderness and Research Natural Areas). The OGMAs are in mixed conifer or ponderosa pine stands and average 300 acres in size. The emphasis for these areas is to provide habitat for wildlife species dependent on old growth stands, with pileated woodpecker as the major indicator species. Adjacent or in proximity to each of these OGMAs is an additional 300 acres (average size) of mapped pileated woodpecker feeding habitat (pfh). The mapped feeding habitat is not identified as a management allocation in the LRMP, but recommendations for this habitat are included along with the standards and guidelines for OGMAs. Generally the OGMAs are intended to provide reproductive habitat for pileated woodpeckers, while the mapped feeding habitat is intended to provide supplemental foraging habitat no further than ½ mile from reproductive areas.

Several of these species were detected and recorded in surveys conducted between 1992 and 1995, and in 2008 and 2010.

Direct and Indirect Effects

Alternative 1- No Action

Alternative 1 is most likely to result in retention of the current pattern of disturbance from unregulated cross country motorized vehicle access, user-created trails, as closure of unauthorized routes would not be done. Since typical user-created trails develop without felling of trees, and since woodpeckers are relatively protected from increases in predation, effects associated with this alternative would be the result of disturbance associated with motorized travel on user created or unauthorized trails rather than through habitat loss or increased predation. As stated below for the action alternatives, recreational trail-associated disturbance does not affect the PCEs, so there would be no direct or indirect effects to primary cavity excavators from implementation of this alternative.

This alternative would not designate any motorized routes, or modify the current patterns of human use in OGMAs or mapped feeding habitat for pileated woodpeckers. Existing user created or unauthorized routes within these habitats would not be closed or rehabilitated.

Action Alternatives (2,3,4)

By design (nesting in tree cavities), woodpeckers and other cavity users are relatively more secure from nest predation than any other group of forest birds because they nest in tree cavities. For the woodpeckers and other cavity nesters, Hamann et al. (1999) and Gaines et al. (2003) have conducted literature reviews of recreational effects, including OHV use. Their reviews showed that recreational trail-associated disturbances did not present a problem to woodpeckers and cavity nesters as a group. Hamann et al. (1999) also stated that recreational activity is unlikely to be focused around nest sites of these species. Gaines et al. (2003) also concluded recreational trail-associated disturbance does not affect the guild. Therefore, recreational disturbance and increased nest predation are not known to be a limiting factor to primary cavity excavators along motorized trails..

Refer to Chapter 2 for a full description of each alternative. Alternatives 2, 3, and 4, propose new trail construction ranging from 50-81 miles (dependent upon alternative) where trees potentially could be felled and thus habitat directly altered. A Project Design Feature (Chapter 2) would limit

tree felling during trail construction unless the trail design cannot be modified. This circumstance would be considered infrequent, as most trails would be routed along previously disturbed areas (also a Project Design Feature). Generally dead trees along trail systems are not felled unless the lean over the trail, or lean toward the trail and are within striking distance of the trail. During initial construction and maintenance on designated routes on closed or decommissioned roads, hazard tree felling may occur. Action alternatives propose trail placement on existing closed and decommissioned roads ranging from 37 to 76 miles (dependent on the alternative). Felled hazard trees would remain on site either as large wood habitat or as strategically placed obstacles to control trail width, to add complexity or difficulty (trail features), or to augment road and trail closures or restoration sites. These actions would be short-term events with project completion taking from a few hours to a few days to implement for each segment. Rehabilitation is not projected to result in any impact to PCEs. Staging areas are also proposed for OHV users including using existing campgrounds, Sno-Parks or mineral sources (rock pits). Alternatives 2 and 4 also propose new staging areas to provide OHV parking and may include amenities like toilets, picnic tables, and fire rings. Larger staging areas maybe three to five acres in size and the small staging with fewer facilities would range from one to two acres in size. Danger tree felling would focus on staging areas where the greatest hazard exists. Since these staging areas involve open roads, mineral sources and existing campsites, some level of hazard abatement will occur in these areas regardless of whether they are established as staging areas or not, see Cumulative Effects below.

Because of the very limited circumstances in which snags or live trees would be removed during construction or maintenance activities, effects would be limited to individual woodpeckers from habitat alteration, alternatives would have a negligible effect on snag distribution and abundance at the landscape scale and no effect to local populations is expected to result from implementation of this project.

The action alternatives would each designate motorized routes within OGMA and mapped feeding habitat for pileated woodpeckers (pfh). Alternative 2 proposes 2.6 miles; Alternative 3 proposes 1.4 miles; and Alternative 4 proposes 2.9 miles of designated route in OGMAs. Each of the action alternatives also proposes to designate motorized routes within mapped feeding habitat as follows: Alternative 2 has 2.8 miles; Alternative 3 has 0.7 miles; and Alternative 4 has 2.5 miles of designated routes in pfh. The majority of these route miles (both in OGMA and pfh) are on existing roads or along the exterior boundary of the OGMA or pfh. Existing unwanted user created or unauthorized routes within these habitats would be closed, concealed and rehabilitated. No habitat would be removed within the Ochoco Summit OHV project area, other than minimal hazardous snags. Because the Ochoco Summit OHV analysis area is over 300,000 acres and there are likely tens of thousands of existing snags present, the impact of removing incidental hazard trees during trail maintenance would not result in a measurable change in available habitat. New trail layout would also avoid placing trails where snags currently exist. Hamann et al. (1999) and Gaines et al. (2003) studies show woodpeckers are not disturbed by OHV traffic. Therefore, Ochoco Summit OHV project will not contribute to a negative trend in viability on the Ochoco National Forest for any primary cavity excavator, including the pileated woodpecker and northern flicker.

Cumulative Effects

With implementation of the Travel Management Rule, motorized travel is restricted to designated routes and existing Maintenance Level 2 (and higher) roads. Hazard tree abatement would continue to occur along 674 miles of open maintenance level 2 roads, 125 miles of maintenance level 3 to 5 roads, at numerous industrial work areas (such as gravel pits, corrals, and industrial camps) and at administrative sites and high recreational use areas (such as campgrounds and trailheads). At the same time continued tree mortality due to inherent levels of insects and disease

would result in snag recruitment overtime which would partially offset loss of snags to hazard abatement and firewood cutting. In addition, many acres of ponderosa pine forests and mixed conifer stands would be treated to maintain open pine-dominated forests with large trees to the benefit of the subset of the woodpecker guild dependent on such habitat. Treatments to improve forest health in all forest types would occur which would alter the rate of tree mortality and thus snag recruitment. Dead and defective tree and log habitat would continue to be well distributed at the landscape scale, though the area along open roads would likely experience reduced snag abundance over time. .

was reviewed for projects that overlap in time and space with the Ochoco Summit OHV project. Several recent large-scale vegetation management decisions have been implemented or are in the process of implementation (Spears, Canyon, Howard Elliot Johnson, Zane, Jackson) or are being planned (Wolf) that partially overlap the Ochoco Summit OHV project area. The hazard trees potentially removed during implementation of these projects added to the very minimal numbers projected for OHV trail maintenance and staging areas, and combined they are not expected to result in measurable changes in existing snag numbers across the analysis area. The primary effect of these vegetation management projects on snag habitat is related to rate, size and density of snag recruitment due to improved forest health. These effects are disclosed in the NEPA documents for those projects and this OHV trail project would result in negligible changes to the rate, size or density of snag recruitment over time. Therefore, no additive cumulative effects to the woodpeckers and other primary cavity nesters are projected due to implementation of this project. In summary, there would be no aggregated effects for the PCEs in general beyond those discussed under direct and indirect effects because planned vegetation management projects, road and facility maintenance, and legally permitted firewood cutting would not appreciably change snag habitat at a landscape scale.

Snag densities on private land in the project area are assumed to be low because most landowners want to reduce wildfire potential and utilize wood products on their land. Consequently, snag habitat is likely limited and may not be available to woodpeckers for very long and would not contribute to nesting populations.

Viability Assessment for Pileated Woodpecker

Background (Ecology): The pileated woodpecker was chosen as a terrestrial management indicator species (MIS) for mature and old-growth forest (LRMP 1989, p. 243 and 251). The pileated woodpecker is also an indicator of late-successional habitat on all forests across the region. It is assumed that if good habitat is provided for pileated woodpeckers and their population is maintained at some desired level, that adequate habitat is also being provided for other species that share similar habitat requirements (LRMP FEIS p. 3-21). The pileated woodpecker plays an important ecological role by excavating nest cavities that are later used by other birds and small mammals (Thomas 1979) and by feeding on forest insect pests.

The pileated woodpecker occurs primarily in dense mixed conifer forests in late seral stages or in deciduous stands in valley bottoms (Marshall et al. 2003). Pileated woodpeckers nest in large diameter (> 21”d.b.h.) and tall snags, and depend heavily on carpenter ants for food. They commonly feed on dead grand fir trees and downed logs. They also roost in large hollow trees and tend to select relatively dense stands with grand fir common. They typically select for multi-strata mixed conifer LOS. The pileated woodpecker’s habitat associates prefer dense forest conditions, and they include Townsend’s warbler, hermit thrush and red-breasted nuthatch among others. Some of these are discussed further in the Landbirds section of this document. As dense mixed coniferous stands often contain a high density of dead or dying trees, habitat for this species also represents habitat for the black-backed and three-toed woodpeckers, which are attracted to stands with abundant snags and activity by bark beetles and wood boring beetles.

Pileated woodpecker habitat is managed through guidelines in the Ochoco Forest Plan and recommendations of best available science. The BBS indicate that the population trend of the pileated woodpecker is increasing in both Oregon and the Northern Rockies BCR during all time intervals. The trend represents the yearly percentage change. During the period of the 1966 to 2006, there was an estimated 2 percent population increase per year in Oregon and a 4.6 percent population increase per year in the Northern Rockies BCR. The Oregon State Heritage Program 2009 list states the pileated woodpecker species ranking as S4, Apparently Secure. NatureServe (2009) listed the following as the top five major threats affecting pileated woodpeckers (1) conversion of forest habitats to non-forest habitats, (2) short rotation, even-age forestry, (3) monoculture forestry, (4) forest fragmentation, and (5) removal of logging residue, downed wood, and pine straw that would ultimately put nutrients back into the ecosystem and provide foraging substrate.

Recommendations for management of the Pileated woodpecker ("Habitat Use and Management of Pileated Woodpeckers in Northeastern Oregon," Bull et al. 1992), includes management of 900 acres of habitat for each territory. It is also recommended that the 900 acres contain 75% grand fir types; 25% would be old growth and the remainder in mature stands. At least 50% would have 60% canopy closure or greater. Dense stands in these relatively moist PAGs, dominated by large tree structure would have provided the best primary nesting habitat for pileated woodpeckers.

Existing Condition: The pileated woodpecker is considered to be an uncommon species in Oregon, limited attitudinally by habitat availability, and they are an uncommon permanent resident in the Blue Mountains (Marshall et al. 2003). Pileated woodpecker habitat for the Ochoco National Forest is defined as ponderosa pine stands with Douglas-fir and grand fir understories, or mixed conifer stands with greater than 15-20 inch in diameter trees and a dense canopy condition. The Ochoco National Forest Land and Resource Management Plan allocated Old Growth Management areas (OGMA) across the Forest to serve as reproductive habitat for the pileated woodpeckers. An additional 300 ac. of supplemental feeding habitat has been designated adjacent to each OGMA reproductive habitat area. Currently there are twenty-five allocated old growth areas within the project's analysis area totaling 7,693 acres. Satellite imagery from 2004 was used to characterize vegetation, which was subsequently used to estimate pileated woodpecker reproductive habitat within the watersheds potentially affected by this project. Currently pileated woodpecker primary reproductive habitat (based on GNN data) includes approximately 7,931 acres across the project area. The satellite imagery only provides a broad scale look at the live-tree component and does not provide information on stand specific snag or down log levels. In general, multistoried large tree structure with a significant fir component with abundant snags is the preferred habitat for the pileated woodpecker. The large blocks of preferred habitat with primary nesting habitat are currently distributed west of Big Summit Prairie and along the northern 1/2 of the analysis area. The OGMAs were surveyed in the 1990s for the presence of pileated woodpeckers. The surveys confirmed the presence of nesting pileated woodpeckers at Polie Creek OGMA. Numerous pileated woodpecker sightings were also recorded within and adjacent OGMAs across the analysis area including: Long Prairie OGMA D1-01; Lytle Prairie OGMA D1-02; Fox Canyon OGMA D1-03; Kemp Spring OGMA D1-04; Davis Spring OGMA D1-06; Lost Lake OGMA D1-07; Indian Butte OGMA D1-08; Peterson Creek OGMA D1-09; Scotts Camp OGMA D1-10; Deep Creek OGMA D1-11; East Porter Creek OGMA D1-12; Rush Creek OGMA D1-13; South Lookout OGMA D1-14; Polie Creek OGMA D1-15; Bridge Creek OGMA D1-17; Nature Creek OGMA D1-18; East Wolf Creek OGMA D2-05 and Chamberlin Spring OGMA D2-11. Pileated woodpeckers have been recorded elsewhere in the analysis area including multiple general sightings at: Snowshoe Point; Marks Lake; Carrol Glade; South Fork Howard Creek; West Fork Howard Creek; east flanks of Round and Lookout Mountains; north and west flanks of Mt. Pisgah; headwaters of Peterson, Porter and Keeton Creeks; Little Summit Creek and north flanks of Paulina Butte; and upper Wolf and Rock Creeks.

Effects Common to All Alternatives: The alternatives would not treat LOS stands or forest stands within pfh or designated OGMAs. All alternatives would maintain the existing acres of fir-dominated understory and canopy closure, at least in the short term. In all alternatives, all existing snags would be left that are not deemed to be a safety hazards. Because the Ochoco Summit OHV analysis area is over 300,000 acres and there are likely tens of thousands of existing snags present, the impact of removing of incidental hazard trees during trail maintenance would not result in a measurable change in available habitat. New trail layout would also avoid placing trails where snags currently exist when not in conflict with other Project Design Criteria (see Chapter 2). Since the action alternatives do not propose harvest of snags, the amount of existing snags present within the project area should not be substantially altered by implementation of any alternative. All alternatives would maintain the suitability of all existing habitat for pileated woodpeckers in the short term.

Conclusion: The pileated woodpecker is widely distributed in North America. It occurs primarily in dense, late seral stages of mixed conifer or deciduous tree stands. Its conservation status globally and nationally is secure and it is apparently secure in the State of Oregon (NatureServe). The pileated woodpecker does not have any special federal listing status as Candidate, Threatened or Endangered but it is listed as Vulnerable in the Blue Mountains on the State of Oregon Sensitive Species list. The State Vulnerable status indicates that the pileated woodpecker is facing one or more threats to their populations but is not currently imperiled with extirpation. The pileated woodpecker is not considered a focal species in the Partners in Flight *Conservation Strategy for Landbirds in the Northern Rocky Mountains of Eastern Oregon and Washington* and is not a priority species on the USFWS *Birds of Conservation Concern*. Population trend data from the North American Breeding Bird Surveys indicate that the pileated woodpecker has an increasing population trend in Oregon and in the Northern Rockies Bird Conservation Region. While the interpretation of this data should be done with caution, a steady population increase is indicated. The Partners in Flight species assessment database also indicates a large population increase in the Northern Rockies Bird Conservation Region. The Partners in Flight population assessment database indicates that in the portion of the Northern Rockies Bird Conservation Region that is in Oregon (Blue Mountains, including the WWNF) the average number of pileated woodpeckers seen per breeding bird survey route was 1.02.

The broad-scale source habitat analysis conducted by Wisdom et al. (2000) indicated that there have been basin-wide declines of source habitat of the pileated woodpecker in the interior Columbia Basin, however, habitat of the pileated woodpecker is strongly increasing in the Blue Mountains Ecological Reporting Unit. In the Blue Mountains ERU there was more than a 100% increase in the amount of source habitat from historical conditions. This analysis was a coarse-scale analysis and based on a large pixel size (100 hectares or 247 acres), and included both private and public lands. Priority nesting habitat of the pileated woodpecker is still available in adequate amounts and distribution to maintain pileated viability on Ochoco National Forest. Currently, there are approximately 14,508 acres of priority nesting habitat on Ochoco National Forest, within 23 of the 34 watersheds (68%) on the Forest (including Crooked River National Grassland). Of the watersheds that historically provided priority nesting habitat (Ochoco National Forest excluding Crooked River National Grassland), 23 of 24 watersheds (96%) currently provide priority nesting habitat.

This viability assessment indicates the pileated woodpecker is well distributed across the Ochoco National Forest and there are adequate amounts, quality, and distribution of habitat to provide for pileated woodpecker population viability. Given the relatively wide range of this species, increasing population and habitat trends, and the amount and distribution of habitat remaining, within the project area, at the forest level and across the eco-region, viability for this species is expected to be provided for on Ochoco National Forest. Given that this project impacts less than

1% of the suitable priority nesting habitat across the Forest, the overall direct, indirect and cumulative effects may result in a very small negative trend of habitat in the short term. However, this reduction in nesting habitat is insignificant at the Forest scale and is not expected to reduce the viability of this species at the Forest level. For these reasons this project is expected to result in continued viability of pileated woodpeckers on Ochoco National Forest.

Viability Assessment for Northern Flicker

Background (Ecology): The northern flicker was chosen as a terrestrial management indicator species (MIS) for old growth juniper (LRMP FEIS 3-21 and 4-96). Many researchers have reported on aspects of behavior and nest use by flickers as part of general studies of cavity nesting birds. Recently such interest has intensified as flickers have been recognized as "keystone" excavators which may influence the abundance of secondary cavity nesters in forest systems (Martin et al. 2004).

Existing Condition: A variety of forest types do exist in abundance and well distributed across the Forest and in this project area, including but not limited to dry site pine and juniper woodlands where large or old juniper and other potential nesting sites are available.

Effects Common to All Alternatives: The proposed action alternatives do not include removal of trees in dry site ponderosa pine PAGs with size class 5. No tree removal within size class 5 juniper PAGs is prescribed. The alternatives are not likely to remove old-growth juniper or other juniper trees with sufficient size and defect to serve as potential nest sites for northern flickers.

Conclusion: Even though the flicker was selected as an indicator for old growth juniper, they do nest in a wide variety of forest types. A variety of forest types do exist in abundance and well distributed across the Forest and in this project area, and this species is widespread and common. None of the alternatives would substantially alter habitat for this species. For these reasons this project will not contribute to a negative trend in viability for northern flickers on Ochoco National Forest.

Big Game - Deer and Elk

The 301,575-acre project area provides both summer and winter range habitat for mule deer and Rocky Mountain elk, including 17,828 acres in Winter Range, 25,183 acres in General Forest Winter Range, and 195,735 acres in General Forest (summer range) allocations. Deer and elk are popular big game species, and are associated with thousands of recreational visitor days to the Ochoco forest each year during hunting seasons, and for general wildlife viewing and photographic opportunities during other times of the year. The Oregon Department of Fish and Wildlife and Travel Oregon contracted with Dean Runyan and Associates in 2008 to conduct an economic analysis by county of fishing, hunting, and wildlife viewing (ODFW 2009). Table 98 and Table 99 display the results that survey participants spent on hunting and wildlife viewing in Crook and Wheeler Counties (based on Oregon Travel Impact 1991-2008). The selected counties in the table show an estimated dollar value placed on consumptive and non-consumptive recreational activities associated with terrestrial wildlife in this part of Oregon.

Table 98. Annual Travel-generated estimated expenditures toward hunting and wildlife viewing in Crook and Wheeler Counties, Oregon (overnight or day trips 50+ miles one way, or non-residents).

County	Hunting Expenditures	Wildlife Viewing
Crook	$2,584,000	$6,769,000
Wheeler	$1,168,000	Sample size too small to report data reliably
Total	$3,752,000	$6,769,000
State Total Percent	3.6%	1.4%
State Total	$104,458,000.	$495,260,000.

Table 99. Annual Local estimated expenditures toward hunting and wildlife viewing in Crook and Wheeler Counties, Oregon (residents and day trips less than 50 miles one way).

County	Hunting Expenditures	Wildlife Viewing
Crook	$683,000	$218,000
Wheeler	$103,000	Sample size too small to report data reliably
Total	$786,000	$218,000
State Total Percent	2.5%	1.0%
State Total	$31,574,000.	$33,173,000.

Table 100 displays mule deer hunting data for the wildlife management unit potentially affected by the project (ODFW 5/2009).

Table 100. Numbers of deer hunters, hunter days and hunter success in the Ochoco Wildlife Management Unit (Years 2008-2009).

Mgmt. Unit and Counties	# of RifleTags 2008 – 2009	# Deer Population Estimate (April 08-09)*	% Success Rifle 2008 - 2009
Ochoco WMU # 237	3,200 - 2,800	15,700 – 15,500	27 - 25
*Population estimate April 2010 was 16,000 deer			

ODFW's interpretation of telemetry data collected from mule deer on Deschutes National Forest between 2005 and 2010 indicated that some collared animals return to the same summer range area each year suggesting strong site fidelity. On Deschutes National Forest, depending on weather conditions, the animals usually return to summer range beginning in April although the spring migration period can last into June. Data also suggest some does drop their fawns before reaching their desired summering area and then continue their migration with their fawns. The fall deer migration to winter ranges usually begins in October and the majority of the deer are out to winter range by mid-November. Some collared deer utilize the same migration route as during the spring and some individuals also appear to follow the same routes in consecutive years (Ardt, pers. comm 2009). Though telemetry data is lacking for deer on Ochoco National Forest, mule deer may not engage in the long distance high density migrations observed with some of the deer of South Central Oregon. Nonetheless, the higher elevations in the Ochoco Summit project area do become snowbound in the winter and deer are known to concentrate in foothills and valley bottoms along the Crooked and John Day Rivers and their tributaries during the winter. Thus, it is likely that during their seasonal movements, some deer migrate across the mid-elevation areas where proposed trails are located.

Spring deer counts are conducted by ODFW to determine population levels as compared to the management objective for each unit. Table 101 shows the April deer counts conducted by ODFW for 2007 - 2012 within the management unit potentially impacted by the Ochoco Summit OHV project.

Table 101. April mule deer populations expressed as a percentage of the management objective (20,500) in the Ochoco Management Unit.

Year	Population Size	Percentage of Management Objective
2007	16,500	80
2008	15,700	77
2009	15,500	76
2010	16,000	78
2011	15,400	75
2012	15,400	75

Mule deer populations in most of the western United States began experiencing a decline in the mid-1990s. The Western Association of Fish and Wildlife Agencies (2004) reported there were a multitude of factors adversely impacting mule deer populations including habitat loss to development, deterioration of forage quality and quantity, droughts, severe winter weather, competition with other ungulates, predation, disease, poaching and increased hunting mortality. As displayed in Table 101, deer populations are currently reaching 75 percent of the management objectives for the Ochoco Wildlife Management Unit (WMU) and showing a relatively stable population over the years displayed. Elsewhere in Central Oregon and across the West, steady declines in deer populations have been noted. Such population declines for big game in Central Oregon may attributable to a combination of factors, such as residential development, disturbance from increased motorized and non-motorized recreation, poaching, predation and hunting season mortality. The enforcement of road closures and hunting regulations have not kept up with the increase in the human population in Central Oregon. Table 102 displays elk hunting data for the wildlife management unit potentially affected by the project (ODFW 5/2009).

Table 102. Numbers of elk hunters, estimated population and hunter success in the Ochoco Wildlife Management Unit (Years 2008-2009).

# of Rifle Tags 2008 – 2009	# of Archery Tags 2008 – 2009	# Elk Population Estimate (08-09)	% Success Rifle 2008 - 2009
1,275 - 1,075	850 - 750	4,300 – 4,000	29 - 25

The ODFW's elk population estimates in the Ochoco WMU are displayed in Table 103. These animals move to several winter range areas associated with foothills and valley bottoms along the Crooked and John Day Rivers and their tributaries. The majority of the summering elk are in small to moderately sized herds in various locations across the Ochoco Mountains. Aspen stands and wet meadow complexes interspersed in coniferous cover and riparian woodlands serve as calving grounds and are also used extensively by elk for foraging areas. Remote areas with limited access, irregular topography and/or effective hiding cover provide security habitats. Elk population estimates are prepared by ODFW to determine population levels as compared to the management objective for each unit. Table 103 shows the elk population estimated by ODFW for 2006 to 2011 within the management unit potentially impacted by the Ochoco Summit OHV project. The elk population, though quite close to the management objective appears to be experiencing a slow decline compared to the population highs estimated in 2006 and 2007. In 2012 a different method was used (Sightability) to estimate the population. The 2012 estimate for elk in the Ochoco WMU was 4,032 elk (90% of the MO).

Table 103. Winter elk populations expressed as a percentage of the management objective (4,600) in the Ochoco Management Unit.

Year	Population Size	Percentage of Management Objective
2006	4,600	100
2007	4,700	102
2008	4,300	93
2009	4,000	87
2010	4,300	93
2011	3,900	85

Mule deer and elk are listed as Management Indicator Species for the Ochoco National Forest and elk in particular can act as a barometer for species sensitive to human disturbance. The Land and Resource Management Plan (LRMP, 1989) provides habitat management direction for big game animals. This project would not substantially impact the amount or arrangement of forage and cover. Thus, the analysis for this project is focused on road density, disturbance and security habitat. For this analysis, road densities and motorized impacts are analyzed by subwatersheds. Target open road densities are 3.0 miles per square mile or less, to achieve deer summer range habitat effectiveness targets. The open road density in this analysis is displayed within the 3 allocations with standards and guidelines for road density related to elk management (Winter Range, General Forest Winter Range and General Forest). Road density is also displayed by watershed to distinguish which areas have the highest open road densities. Disturbance was evaluated using distance banding from motorized routes. Bands close to motorized routes have high potential for disturbance to big game, while areas distant from any motorized route have low probability for disturbance to big game from use of the route. Elk security habitat is based on distance from any motorized route of more than ½ mile. High value elk security habitat meets that criteria and occurs in blocks at least 250 acres in size.

Key Indicators for Big Game Habitat

Effects to big game will be displayed at several scales including 5th field watersheds and 6th field subwatersheds and the entire analysis area. The following indicators will be used to compare the effects of alternatives to big game:

- Open road and trail miles available for motorized use within 6th field subwatersheds expressed in miles of route per square mile of National Forest System roads and trails.
- Number of 6th-field subwatersheds with an open route density of greater than 3.0 miles of National Forest System roads and trails open for motorized use.
- Acres of National Forest land greater than 1 mile from an open motorized route in the project area.
- Acres of National Forest land within 4 distance bands within 1 mile from an open motorized route and percent of the project area.
- Acres providing elk security habitat (>1/2 mile from an open motorized route).
- Acres providing elk security habitat (>1/2 mile from an open motorized route) in patches at least 250 acres in size.
- Potential for displacement of big game onto private land as expressed by acres of secure cover within 1 mile of private land.

Of the indices included in the Habitat Effectiveness Index analysis (HEI), motorized route density is the only one that may be affected under the proposed alternatives. This is because change in cover under the proposed alternatives is negligible at the landscape scale. Refer to the section on Physical Alteration of Habitat under General Effects to Wildlife. If the maximum direct physical

impact to forested habitat from trail construction is 190 acres (Alternative 4), and the total acres in General Forest in the analysis area is 195,735 acres, then the largest potential change in cover would be less than 1/10th of one percent at the landscape scale. Since the cover quantity index is derived from tables based on ranges of 4 percentage points, and the cover quality index is based on 10% increments of relative percentages in canopy closure which are not likely to be moved by a change of less than 1/10 of one percent, these indices are not sensitive enough to detect a change of such a small magnitude. Thus, measures based on findings in research from the Starkey Project (Wisdom, et al. 2005), were used as the key indicators for big game effects and serve as the primary basis for comparison of potential alternative impacts on big game. These measures are focused on distance from motorized routes and availability of security habitat.

Effects of Motorized Vehicle Access to Big Game

Effects to deer and elk habitat from motor vehicle access can be discussed in terms of direct and indirect impacts from disturbance, impacts to habitat, and increased legal and illegal harvest. The LRMP approved in 1989 recognized a need to limit motor vehicle access, and set guidelines on target road densities for elk winter range and elk summer range. Of the indices included in the Habitat Effectiveness Index analysis (HEI), motorized route density is the only one that may be affected under the proposed alternatives. Therefore the road density index will be addressed under the cumulative effects below. At the time the LRMP was written no guidelines were drafted to account for off-highway vehicle use, consequently motorized densities were based on passenger cars, two wheel and four-wheel drive trucks on open system roads. Off-highway vehicle use has increased greatly since 1990 and is contributing to the amount of motorized vehicle use across the Forest including this project area. Public scoping letters and participation in public meetings conducted for this project indicate many users may prefer trails over driving on roads because of the reduced traffic levels and for the recreational experience provided by trails with complexity, technical difficulty and interesting features.

Disturbance

Stankowich (2008) conducted a comprehensive review and meta-analysis of research on ungulate escape responses from human and vehicle disturbances. His review found evidence that ungulates pay attention to approacher behavior, have greater perceptions of risk when disturbed in open habitats, and that females or groups with young offspring show greater flight responses than adult groups. He also found that humans on foot were more likely to evoke a response than other stimuli (vehicles, noises) and that hunted populations showed significantly greater flight responses than non-hunted populations.

A key element of elk habitat management is providing hiding cover and security areas especially during the fall hunting seasons. Some studies have shown that elk when disturbed by motor vehicles will leave an area that lacks sufficient hiding cover (Hillis et al. 1991 and Wisdom et al. 2004). Hillis et al. (1991) defined elk security cover as forested habitat at least 250 acres in size and at least ½ mile from a road open to motorized travel. Recent studies at the Starkey Project in northeast Oregon (Wisdom et al. 2005) have disclosed even more information on the effects of roads and road densities on deer and elk. Rowland et al. (2000) summarized the direct impacts of roads and associated traffic on elk, in addition to outright mortality from vehicular collisions as follows: (1) Elk avoid areas near open roads but avoidance varies in response to traffic rates; (2) Elk vulnerability to mortality from hunter harvest, both legal and illegal, increases as open road density increases; and (3) In areas of higher road density, elk exhibit higher levels of stress and increased movement rates. Rowland et al. (2005) also noted that elk use increased as distance from open roads increased and suggested that judicious closing of certain road segments, particularly road spurs, may retain or create blocks of habitat that serve as security areas for elk while allowing sufficient road access for other management needs.

An important finding from the Starkey Experimental Forest and Range studies is that road (or route) density is not the best predictor of habitat effectiveness for elk. Instead a model based on distance bands proved to be a more spatially explicit and biologically meaningful tool for assessing effects from roads. Road densities do not provide a spatial depiction of how roads are distributed on the landscape (Rowland 2005). Consequently, a distance banding analysis was conducted on the 301,575 acre project area. Using geographical information systems (GIS), open motorized routes (roads and trails) were buffered at five scales to display the amount of National Forest acreage within the buffers. The distance bands included: a) acres and percent of the project area within ¼ mile, b) acres and percent of the project area ¼ to ½ mile from an open motorized route, c) acres and percent of the project area ½ to ¾ mile from an open motorized route, d) acres and percent of the project area ¾ to 1 mile from an open motorized route and e) acres and percent of the project area greater than one mile from an open motorized route. Hillis et al. (1991) defined elk security habitat for forested stands greater than 250 acres in size and greater than ½ mile from an open route. Acreage in cover greater than ½ mile from an open motorized route is assumed to provide greater security for elk than cover within ½ mile of a motorized route. Thus, the amount of cover more than ½ mile from motorized routes and within 1 mile of private land was used as a measure of potential to avoid displacement of elk from federal onto private land.

Disturbance impacts to mule deer from off-road use, including motorized use, are more difficult to quantify. Mule deer studies from the Starkey Project in northeastern Oregon showed little measureable response to off-road treatments (ATV riding, mountain biking, hiking and horseback use) as compared to control periods of no activity reported by Wisdom et al. (2004). Mule deer movement rates increased only slightly however, during periods of all four off-road activities except ATV riding. Estimated probabilities of mule deer flight response were similar among all four activities versus control periods. This suggested that deer were not exhibiting the same tendency for flight as shown by elk in relation to off-road activities. However, Wisdom et al. (2004) also reported that deer may be responding to fine-scale changes in habitat use, rather than substantial increases in movement rates and flight responses. For example, it is possible that deer may respond to an off-road activity by seeking dense cover rather than running from the activity. This could lead to animals spending more time in dense cover and less time foraging, resulting in less fat reserves for winter survival.

Studies by Stankowich (2008) showed that humans on foot have more impact on mule deer than other stimuli studied (vehicles, noise, and horseback). Ferris and Kutilek (1989 in Montana TWS 1999) found black-tailed deer avoided OHV areas during high peak use but returned to established home ranges after traffic levels subsided.

In another study Yarmoloy (1988 in Ouren et al. 2007) studied mule deer does equipped with radio collars and several were intentionally followed by ATVs for nine minutes a day for 15 days. The harassed does shifted their feeding patterns into darkness, used cover more frequently, and increased their flight distance from ATVs. The harassed does also showed reduced reproduction success the following year as compared to the control does that were not harassed. These effects would not be expected to occur in most of the project area because off-route travel would not be permitted under any action alternative (see Project Design Features, Chapter 2).

Hayden et al (2008) stated that disturbance factors in and of themselves have generally not been implicated in lower mule deer population performance. However, given the nutritional and energy requirements of deer, it seems reasonable to assume such factors could combine with a number of other factors to negatively impact deer. Habitat Guidelines for Mule Deer in the Northern Forest Ecoregion (Hayden et al. 2008) provided a list of recommendations to minimize negative effects of human encroachment. Those applicable to the project include:

- Develop consistent regulations for OHV use.
- Develop and maintain interagency coordination in enforcement of OHV regulations.
- Designate specific areas and times (seasonal use restrictions) for activities such as OHV use that disturb habitat or deer.
- Cluster recreational activities to maintain or create large blocks of undisturbed habitat. Direct new development toward previously disturbed areas (clumped rather than dispersed distribution).
- Seasonally separate humans and mule deer at critical periods.
- Through education, modify human behaviors to reduce recreational effects to mule deer.
- Monitor activities that may unduly stress deer at important times of the year. Reduce or regulate disturbance if deemed detrimental. When applicable, encourage enforcement of regulations regarding dogs running at large or chasing wildlife and wildlife harassment by snowmobiles and OHVs.

At the present time, motorized road use in the OHV analysis area could be described as low to moderate during most of the year. Typically, most roads begin to melt out from winter snow in April and motorized use is available until November depending on snowfall timing and depth. During the spring and summer, road use is generally light, except near dispersed campsites along the main roads and where personal use firewood cutting is permitted. The general exceptions are roads and user-created OHV trails near population centers such as Prineville, which see substantial use during all periods that roads and trails are snow-free. However, motorized use in the entire project area changes dramatically beginning in late August with the onset of archery hunting season. The rifle deer season starts in late September or early October and is followed by rifle elk season in mid-October. Usually in early November the legal personal use firewood permittees shut down because of the end of the season and/or snowfall closes access roads.

Off-Road Recreation Effects

The amount of habitat impacted by OHVs and 4-wheel drives and random cross-country travel is difficult to quantify. It is unlikely all motorized trails have been located; consequently, the amount of habitat currently being disturbed by motorized travel is only estimated. As noted in the Recreation section, based on estimates from the 2008 National Visitor Use Monitoring (NVUM) survey on the Ochoco National Forest, more than 14,000 forest visitors participated in OHV or Motorized Trail Activities on the Forest in that year. For the purpose of this analysis, it is assumed that there are approximately 5000 visitors participating in OHV use within the project area (slightly more than 1/3 of the estimated total forest OHV participation). Most of this use occurs seasonally as the higher elevations become inaccessible due to snow. Based on observational data from Forest Service staff, the heaviest use within the Ochoco Summit project area occurs on summer weekends, and holidays from approximately May 1 – Sept. 30, with less recreational use occurring weekdays, and during the shoulder seasons. An exception to this is during hunting season. Starting with bow hunting in August and continuing through November, there are hunting camps scattered across the area. During this time, there is increased use of OHVs primarily for hunting purposes, not recreational riding. Most of the ongoing recreational OHV use in the analysis area occurs in the Marks Creek and Ochoco Creek subwatersheds, especially in the spring when the higher elevation areas are still snowed in. Later in the season OHV use increases in the central and eastern portions of the analysis area as the snow free season progresses. Known routes in use identified previously by the Central Oregon Motorcycle and ATV Club (COMAC) included routes in eight of the nine watersheds in the analysis area. However many of the miles identified by COMAC are on open roads. Therefore the length of

routes identified by COMAC cannot be used to estimate off-road impacts to big game. Also there is an important distinction between recreational ATV use and use by hunters to access hunting areas or to retrieve game. Recreational users are more likely to use narrow, winding or difficult routes, while hunters on ATVs are more likely to use wider and straighter routes such as roads, whether open or closed (personal communication, Ramming, 2010).

Studies have examined deer and elk response to modes of off-road recreation at Starkey in northeastern Oregon (Wisdom et al. 2005; Naylor et al. 2009). Wisdom et al. (2005) measured responses by mule deer and elk to four off-road recreation activities including hiking, mountain biking, horse riding, and ATV riding. The distance deer and elk moved and movement rates were measured in response to the activity and during control periods where no recreational activity was permitted. Mule deer responses contrasted sharply with elk. Mule deer showed little measureable response to the off-road treatments. However, movement rates increased slightly, during periods of all four off-road activities except ATV riding. Wisdom hypothesized that deer may well be responding to the treatments with fine-scale changes in habitat use (such as seeking cover), rather than substantial increases in movement rates and flight responses. The response by deer to human disturbance can also be complicated in areas with elk due to interspecific avoidance. Johnson (2000) found that while elk selected gentle slopes farther from roads and on westerly aspects, deer selected steeper slopes, closer to roads and on easterly aspects. Johnson concluded that elk and mule deer select resources in opposite ways on shared ranges during the spring in the Blue Mountains Province, and that mule deer selection appears to be explained in large part as a result of avoidance of areas used by elk.

However, Wisdom et al. (2004) cautioned against inferring their study results to other areas where mule deer are common and elk are absent or sparse. In the absence of moderate or high densities of elk, mule deer may exhibit different distribution and selection patterns in relation to roads and traffic. Within the Ochoco Summit analysis area elk densities are moderate to high. Spatial separation of elk and deer on spring and summer range may occur in the Ochoco Summit area, such as has been observed in numerous studies: Collins and Urness (1983), Wallace and Krausman (1987), Wickstrom et.al. (1984), Latham et.al (1996, 1997), Wisdom et al. (2005) and Johnson (2000). Therefore, if elk patterns of movement or use are altered as a result of human activity, then mule deer use may increase in areas avoided by elk.

Movement rates by elk increased substantially during off-road activities as compared to the control periods (Wisdom et al. 2005 and Naylor et al. 2009). ATV use showed the greatest response by elk resulting in the greatest increase in movement, distance moved, and probability of flight response. The study suggests that elk were displaced from preferred security and foraging areas as a result of flight behavior during the daytime off-road activities. ATV riding and mountain biking caused the largest reductions in elk feeding time and increases in elk travel time and elk showed no habituation to mountain biking (Naylor et al. (2009). Preisler et al. (2006), in a study of elk and ATV use at Starkey, showed that elk appeared to respond at long distances (greater than 1,000 meters) to ATVs and that the estimated probability of flight appeared to be higher when elk were closer to ATV routes, even when the distance to the ATV was large. His study noted that a significant number of elk appear to ‘freeze’ while the ATVs pass very close (50-100 meters) that seem to suggest the possibility that elk are using topography and vegetation to escape detection at close distances to roads. Preisler et al. (2006) also concluded that over successive days of treatments (exposure to ATV riders) elk appear to adjust their distribution so that they are located closer to areas that are not visible from routes and during the nine days of rest in-between treatments, the animals appeared to return to their pretreatment distributions. Naylor (2008) found that elk behavior patterns were similar to controls each morning before treatments (ATV exposure) commenced, and then returned to pre-disturbance level 1 to 2 hours after each treatment ended. He also found that behavior patterns outside of the treatment times

appeared to be unaffected by the treatment activity. Preisler (2006) also noted that during days 4 and 5 of treatment elk appeared to have either habituated to the activity or found close refugia, rather than fleeing to the far corners of the study pasture. He concluded that over successive days of treatment, that elk appear to adjust their distributions so that they are located in or closer to areas that are not visible from the motorized route.

To assess the amount of big game habitat impacted from motorized disturbance a distance banding analysis was completed showing acreage within four distance bands within 1 mile of open roads or motorized trails, and acres in two distance bands greater than 1 mile from an open road or motorized trail. This analysis does not separate the on-road and off-road effects, but considers them in combination with equal impacts. The distance bands were selected based on several references, including: ODFW (2009); Mason, Bruce and Girard, Inc for ODFW (2008); Preisler (2006); Rowland (2000, 2005), Roloff (1998) and Gaines (2003).

Effects from Legal and Illegal Harvest

Roads open for motorized use provide the predominant hunter access into the Ochoco GMU. As shown in Table 104, current overall open road densities in the watersheds range from 1.17 mi/mi^2 to 2.34 mi/mi^2. The greater the open motorized route density the greater the potential for game violations. Road hunting in itself is not considered illegal by the State of Oregon as long as the driver steps away from the road surface to fire the weapon. High open road and/or motorized trail densities may provide additional access for poaching of big game animals. Poaching is considered one of the factors contributing to the general decline in mule deer numbers in Central Oregon. However, as stated above, trails proposed under this project would be designed for slow speed and increased technical difficulty so would not necessarily provide easy access for poachers.

In addition to big game mortality from motorized access, there are other impacts to deer and elk. Johnson et al. (2004 in Wisdom et al. 2005) stated that elk trying to elude hunters can deplete fat reserves needed for over-winter survival and that elk responded to hunters by fleeing, whereas deer appear to elude hunters by hiding. Cook et al. (1996, 2005) reported that forage intake and nutritional quality during August and September can be determinants of winter survival of elk calves. Cook et al. (2005) also reported that the effects of the summer-autumn nutrition on fat accretion of cows and growth of calves significantly influenced their survival probability under harsh winter conditions. These months coincide with archery elk seasons and also when other recreationists such as late season campers, photographers and other forest visitors take to the woods to enjoy the fall colors. Time spent hiding from people takes away from foraging. While Rowland et al. (2000, 2004) found elk showed increasingly strong selection toward areas with increasing distance from roads open to motorized traffic, some recreationists would travel on foot that distance to pursue their activity. The research at Starkey also indicated that mule deer moved closer to roads with the assumption that they changed their distribution within the study area in relation to opposite changes in distribution by elk. This could lead to higher levels of deer harvest where road densities are also high.

The distributional pattern of open roads and motorized trails is important in determining the security an area can provide for elk during hunting seasons. Where possible, clumping road/trail closures can maintain security areas, which Hillis et al. (1991) have described as a non-linear patch greater than 250 acres in size and greater than ½ mile from an open motorized route. Other authors have also referred to the ½ mile distance as a threshold for security (Rowland, 2005) though smaller patches may also be of benefit. Other authors have suggested that the highest impacts occur within the first ¼ mile (ODFW, 2008; Gaines, 2003). Some references imply that the level of the impact decreases on a continuum as distance from motorized increases (ODFW, 2008; Rowland, 2000, 2005). In their report to ODFW, Mason et al (2008) stated that the anticipated effect of a roadway on deer and elk drops to zero one mile (1600 m) away from the

road. Naylor (2000) states that a distance greater than 1,290 m was beyond the distance where roads would greatly affect elk distribution. Gains (2003) provides tables displaying suggested zones of influence for a variety human uses, including motorized routes. He suggests a zone of influence on deer and elk of 300 m for motorized trails and up to 1300 m for open roads. The effects discussion on alternatives provide analysis conducted at several distance banding scales to determine and display various zones of influence and the amount of security habitat for big game under each alternative.

Table 104 displays open road and motorized trail densities in the analysis area expressed as miles of route per square mile of land base on National Forest System land within each 5th field watershed. All acres within any subwatershed that overlapped with any project alternative have been included in the analysis; the actual area within 1 mile of any proposed motorized trail system is about 100,000 to 110,000 acres.

Table 104. Total combined open motorized density of roads and trails expressed in miles per square mile, by alternative and watershed (National Forest System lands only) without mitigation.

5th Field Watershed	5th Field square miles NFS Lands Only	Alt. 1 Total Motorized Density(Roads + Trails) mi/mi2	Alt. 2 Total Motorized Density (Roads + Trails) mi/mi2	Alt. 3 Total Motorized Density (Roads + Trails) mi/mi2	Alt. 4 Total Motorized Density (Roads + Trails) mi/mi2
Bridge Creek	24.37	1.31	1.31	1.31	1.33
Deep Creek	82.25	1.90	2.57	2.34	2.68
Lower Beaver Creek	36.86	1.60	1.85	1.85	1.90
Lower North Fork Crooked River	33.52	1.27	1.27	1.27	1.27
Mountain Creek	30.06	1.17	1.20	1.17	1.20
Paulina Creek	25.15	1.89	1.93	1.93	1.93
Rock Creek	22.16	1.52	1.56	1.56	1.56
Upper North Fork Crooked River	139.07	2.34	2.65	2.46	2.66
Upper Ochoco Creek	74.70	1.66	1.81	1.95	2.10
Total	471.14	1.83	2.09	2.01	2.17

Direct and Indirect Effects - Big Game

Alternative 1 – No Action

Disturbance

Alternative 1 would be most likely to retain the current pattern of disturbance from unregulated cross-country motor vehicle access, user-created trails, and use of closed roads because no closure of unauthorized routes would be implemented under this alternative. This alternative would provide the poorest distribution of security habitat for deer and elk due to the current configuration of open roads. There would be no opportunity to close roads, reinforce existing closures, designate a defined OHV trail system or rehabilitate user-created trails. Open road densities on National Forest system lands would remain at the current level (refer to Table 104). Open road densities would exceed Forest Plan guidelines of 3.0 mi/mi^2 in General Forest allocation in 2 of the 31 subwatersheds in the analysis area (Lower Big Summit Prairie and Lower Marks Creek; see Table 105). Mixed use by passenger cars, industrial traffic and OHVs would occur on 659 miles of operational maintenance level 2 roads. Motorized use other than by OHVs would continue to occur on 140 miles of highway legal only (maintenance level 2 to 5) roads.

Table 105. Subwatersheds with Open Road Density at or above 3 miles/sq. mile in General Forest, Alternative 1 combined with closures proposed in other projects.

Watershed	Subwatershed	Management Area – miles/sq. miles
Upper North Fork Crooked River	Lower Big Summit Prairie	3.31 GF
Upper Ochoco Creek	Lower Marks Creek	3.15 GF

Distance banding analysis of existing open roads (based on operational maintenance level) shows there are a total of 50,177 acres of National Forest lands greater than 800 m (1/2 mile) from an existing road. This represents approximately 17% of the analysis area. Of these, 47,969 acres occur in patches greater than 250 acres in size, or 96% of the total area more than ½ mile from an open road. Security areas in patches greater than 250 acres are distributed across all nine watersheds (and 28 of 31 subwatersheds) within the analysis area. The subwatersheds that did not contain elk security patches greater than 250 acres are Drift Canyon (in Lower Beaver Creek), Middle Rock Creek (in Rock Creek) and Lower Big Summit Prairie (in Upper North Fork Crooked River). In contrast, 115,127 acres (38 percent) of the project area are within 200 m (660 feet) of an existing open road. These high-disturbance zone acres are distributed across all nine watersheds (and 30 of 31 subwatersheds) in the analysis area. Within these areas elk would continue to experience high levels of disturbance from motorized use. It is assumed that lands within the 200 m (660 foot) zone are unavailable for consistent elk use as cover or foraging areas at least during daylight hours when motorized traffic is more likely to occur.

Off-road Motor Vehicle Access

Unregulated motorized access from all user groups would likely continue to degrade big game habitats because no closure of unauthorized routes would be implemented under this alternative. This would result from unregulated access into deer hiding cover patches, elk security cover blocks, and into calving and fawning grounds during critical time periods of May and June. In the absence of a designated system of OHV routes, it is reasonable to assume user-created trails may continue to increase in mileage and further expand across the analysis area until the Travel Management Plan is fully implemented. Legal and illegal harvest of deer and elk would be expected to continue at the same rate or slightly increasing as human population increases and more user-created motorized routes are established.

Negative impacts including disturbance during calving seasons would be expected to continue at the current trend. Security areas in patches greater than 250 acres in size would be available to elk across nine 5th field watersheds in the analysis area as displayed in Table 106. This alternative would provide a total of 47,969 acres of security habitat in blocks greater than 250 acres in size. Security areas (greater than ½ mile from open roads) in patches less than 250 acres in size would occur on a total of 2,208 acres distributed across eight watersheds. There would also be no opportunity to reduce road densities or increase security habitat acreage.

Table 106. Acres of Elk Security Area Greater than ½ mile from any open motorized routes.

5th Field Watershed	Watershed Acres (ONF)	Alt. 1 Elk Security Area Acres	Alt. 2 Elk Security Area Acres	Alt. 3 Elk Security Area Acres	Alt. 4 Elk Security Area Acres
Bridge Creek	15,595	4,385 (4,274)	4,373 (4,263)	4,373 (4,263)	4,373 (4,263)
Deep Creek	54,561	4,551 (3,745)	1191 (378)	2,114 (1,024)	794 (1)
Lower Beaver Creek	23,611	4,364 (4,176)	3,559 (3,421)	3,559 (3,421)	3,559 (3,421)
Lower North Fork Crooked River	21,458	4,920 (4,868)	4,644 (4,593)	4,644 (4,593)	4,644 (4,593)
Mountain Creek	19,244	6,986 (6,986)	6,959 (6959)	6,986 (6,986)	6,959 (6,959)

Table 106. Acres of Elk Security Area Greater than ½ mile from any open motorized routes.

5th Field Watershed	Watershed Acres (ONF)	Alt. 1 Elk Security Area Acres	Alt. 2 Elk Security Area Acres	Alt. 3 Elk Security Area Acres	Alt. 4 Elk Security Area Acres
Paulina Creek	16,094	1,704 (1,609)	1,697 (1,602)	1,697 (1,602)	1,697 (1,602)
Rock Creek	14,181	3,567 (3,466)	3,510 (3,409)	3,510 (3,409)	3,510 (3,409)
Upper North Fork Crooked River	89,005	9,907 (9,433)	9,362 (9,104)	9,778 (9,108)	9,352 (9,067)
Upper Ochoco Creek	47,832	9,793 (9,412)	9,078 (8,734)	8,486 (8,108)	8,197 (7,819)
Total	301,580	50,177 (47,969)	44,374 (42,460)	45,148 (42,514)	43,085 (41,132)

Acres in ( ) are in blocks greater than 250 acres in size.
Shaded cells represent more than 10% reduction in total elk security area.
Bold print acres represent more than 50% reduction in 250+ acre security areas.

Alternative 2 – Proposed Action

Disturbance and Off-road Motor Vehicle Access

Alternative 2 would reduce the current pattern of disturbance from unregulated cross-country motor vehicle access, user-created trails, and use of closed roads because of the rehabilitation and concealment proposed at 89 sites on user created routes, 11 sites on decommissioned roads and 109 sites on closed roads. Alternative 2 would reinforce existing closures. However, this alternative would also increase the length of motorized route network by 69 miles. This alternative would provide a system of designated routes intended to provide a legal, planned, designed, engineered and maintained series of routes for motorized use. This should reduce the level of traffic on existing unauthorized or unwanted user-created routes. A regulated trail network would be established, providing approximately 69 miles of new motorized trails and up to 55 miles of roads converted to trails for a total of 124 miles in the designated trail system. The trail systems would be linked with shared use roads, including 46 miles which would be designated as connecting routes for the trail network.

Refer to Chapter 2 for a detailed description of each alternative. It is projected that motorized use would increase approximately 2 to 5 percent per year as the OHV trail system develops and becomes more widely known to users.

Legally open road and trail densities on National Forest system lands would increase in some watersheds as shown in Table 104. Open road densities would exceed Forest Plan guidelines of 3.0 mi/mi2 in General Forest allocation on 4 of the 31 subwatersheds in the analysis area (Elliot Creek, Lower Big Summit Prairie, Porter Creek and Lower Marks Creek; see Table 107). Mixed use by passenger cars, industrial traffic and OHVs would occur on 659 miles of operational maintenance level 2 roads. It is projected that motorized use would increase approximately 2 to 5 percent per year as the OHV trail system develops and becomes more widely known to users. Motorized use other than by OHVs would continue to occur on 140 miles of highway legal only (maintenance level 2 to 5) roads.

Table 107. Subwatersheds with Open Road and Trail Density at or above 3 miles/sq. mile in General Forest, Alternative 2 combined with closures proposed in other projects.

Watershed	Subwatershed	Management Area – miles/sq. miles
Deep Creek	Jackson Creek	2.95 GF
Upper North Fork Crooked River	Elliot Creek	3.06 GF
	Lower Big Summit Prairie	3.31 GF
	Porter Creek	3.26 GF
Upper Ochoco Creek	Lower Marks Creek	3.15 GF

Distance banding analysis of the combination of existing open roads (based on operational maintenance level) and proposed trails indicates that there would be a total of 44,374 acres of National Forest lands greater than 800 m (1/2 mile) from an existing road. This represents approximately 15% of the analysis area (a 2% reduction compared to existing condition). Of these, 42,460 acres occur in patches greater than 250 acres in size, or 96% of the total security area more than ½ mile from an open road. Security areas in patches greater than 250 acres are distributed across all nine watersheds (and 27 of 31 subwatersheds) within the analysis area. The subwatersheds that did not contain elk security in patches greater than 250 acres are Drift Canyon (in Lower Beaver Creek), Middle Rock Creek (in Rock Creek), Lower Big Summit Prairie and Porter Creek (in Upper North Fork Crooked River). In contrast, 125,740 acres (42 percent) of the project area would be within 200 m (660 feet) of an open road or motorized trail. These high-disturbance zone acres are distributed across all nine watersheds (and 30 of 31 subwatersheds) in the analysis area. Within these areas elk would continue to experience high levels of disturbance from motorized use. It is assumed that lands within the 200 m (660 foot) zone are unavailable for consistent elk use as cover or foraging areas during daylight hours when motorized traffic is more likely to occur.

Rocky Mountain Elk Foundation (RMEF) has mapped elk habitat at a State by State scale. This habitat map may be too coarse of a scale to predict high use areas at the local level. However, the alternative was compared to the RMEF map, particularly areas identified as “crucial.” Under this alternative, 31 miles of designated routes occur within RMEF’s Crucial Winter Habitat including routes both on and off of existing open roads. This represents 18% of the total designated route miles under this alternative. Assuming a reduction in habitat availability of 200 meters on each side of the route (160 acres per mile), this would translate to a potential reduction of 4,960 acres, or approximately 9 percent of the 53,435 acres of winter crucial habitat mapped within the analysis area. However, the this mapped habitat is coded as summer, winter crucial and winter habitat on the RMEF map, and includes elevations ranging from 3800 feet to over 6,200 feet including all available aspects and slopes (including north facing cliffs and talus slopes). It is also entirely within the Rager Travel Management area where motorized access is limited as described above. The proposed season of OHV use for the trail network is outside of the critical winter period both inside and outside of the Rager TMA under all action alternatives. Therefore, although these routes are within the polygon shown on the RMEF habitat map as crucial winter habitat, the proposed trails would not be open for use by OHVs during the critical winter period. The impact of these trails on elk habitat would be during the summer use period. The entire 301,575 acre analysis area is coded as summer habitat on the RMEF map regardless of slope, elevation, aspect or terrain features. Using the same assumptions as described above, the 170 miles of trail system (including 46 miles of open roads) could increase impacts to summer habitat on 9 percent of the RMEF mapped summer habitat within the analysis area.

Potential elk calving and deer fawning areas were mapped based on areas in proximity (within ¼ mile) to meadows, aspen and other riparian shrub habitats, where such areas occur on terrain with less than 25% slope. Under this alternative 84 miles of designated routes occur within potential elk calving habitat. Of those 30 miles are on open roads and 54 miles are not on open roads.

There is potential for increased traffic on open roads included as part of the OHV trail system as well as on proposed routes that are not on open roads. Assuming a reduction in habitat availability of 200 meters on each side of the route (160 acres per mile), proposed system routes would impact habitat in potential elk calving areas on 13,440 acres or 12 percent of the 115,540 acres available within the analysis area.

This alternative would have a moderate impact to elk compared to Alternatives 3 and 4 because of the amount of road closures, medium trail extent and density. As shown in Table 106, Alternative 2 would result in a reduction in amount and distribution of undisturbed security habitat for deer and elk compared to Alternatives 1 and 3. Designation of new motorized routes would result in the decrease in lands greater than ½ mile from a route. This alternative would provide a total of 42,460 acres of security habitat in blocks greater than 250 acres in size. Security habitat less than 250 acres in size do not provide the same security cover advantages present in larger security area blocks, but they would occur on USFS managed land on 1,914 acres.

Alternative 3

Disturbance and Off-road Motor Vehicle Access

Alternative would reduce the current pattern of disturbance from unregulated cross-country motor vehicle access, user-created trails, and use of closed roads because of the rehabilitation and concealment proposed at 54 sites on user created routes, 7 sites on decommissioned roads and 84 sites on closed roads. This treatment would reinforce existing closures. However, this alternative would also increase the length of the motorized route network by 50 miles. This alternative would provide a relatively compact system of designated routes intended to provide a legal, planned, designed, engineered and maintained series of routes for motorized use. This alternative focuses on reducing impacts to big game, water, fish and non-motorized recreation. High density trail areas (described as moderately dense loops) are proposed in proximity to the Ochoco Divide Sno-Park and Walton Sno-Park on the west end of the analysis area. This alternative would leave a large gap between two separate trail systems. This should reduce the level of traffic on existing unauthorized or unwanted user-created routes within the portions of the landscape where designated routes are proposed. A regulated trail network providing approximately 50 miles of new motorized trails and up to 38 miles of roads converted to trails for a total of 88 miles in the designated trail system would be established. The trail systems would be linked with shared use roads, including 13 miles which would be designated as connecting routes for the trail network. Refer to Chapter 2 for a detailed description of each alternative. It is projected that motorized use would increase approximately 2 to 5 percent per year as the OHV trail system develops and becomes more widely known to users.

Open road densities on National Forest system lands would increase in some watersheds as shown in Table 104. Open road densities would exceed Forest Plan guidelines of 3.0 mi/mi^2 in General Forest allocation on 2 of the 31 subwatersheds in the analysis area (Lower Big Summit Prairie and Lower Marks Creek; see Table 108). Mixed use by passenger cars, industrial traffic and OHVs would occur on 659 miles of operational maintenance level 2 roads. Motorized use other than by OHVs would continue to occur on 140 miles of highway legal only (maintenance level 2 to 5) roads.

Table 108. Subwatersheds with Open Road and Trail Density at or above 3 mi/sq. mi in General Forest, Alternative 3 combined with closures proposed in other projects.

Watershed	Subwatershed	Management Area – miles/sq. miles
Upper North Fork Crooked River	Lower Big Summit Prairie	3.01 GF
Upper Ochoco Creek	Lower Marks Creek	2.40 GF

Distance banding analysis of the combination of existing open roads (based on operational maintenance level) and proposed trails indicates that there would be a total of 45,147 acres of National Forest lands greater than 800 m (1/2 mile) from an existing road. This represents approximately 15% of the analysis area (a 2% reduction compared to existing condition). Of these, 42,514 acres occur in patches greater than 250 acres in size, or 94% of the total security area more than ½ mile from an open road. Security areas in patches greater than 250 acres are distributed across all nine watersheds (and 27 of 31 subwatersheds) within the analysis area. The subwatersheds that did not contain elk security in patches greater than 250 acres are Drift Canyon (in Lower Beaver Creek), Middle Rock Creek (in Rock Creek), Lower Big Summit Prairie and Porter Creek (in Upper North Fork Crooked River). In contrast, 123,032 acres (41 percent) of the project area would be within 200 m (660 feet) of an open road or motorized trail. These high-disturbance zone acres are distributed across all nine watersheds (and 30 of 31 subwatersheds) in the analysis area. Within these areas elk would continue to experience high levels of disturbance from motorized use. It is assumed that lands within the 200 m (660 foot) zone are unavailable for consistent elk use as cover or foraging areas during daylight hours when motorized traffic is more likely to occur.

Rocky Mountain Elk Foundation (RMEF) has mapped elk habitat at a State by State scale. This habitat map may be too coarse of a scale to predict high use areas at the local level. However, the alternative was compared to the RMEF map, particularly areas identified as "crucial." Under this alternative, 15 miles of designated routes occur within RMEF's Crucial Winter Habitat including routes both on and off of existing open roads. This represents 15% of the total designated route miles under this alternative. Assuming a reduction in habitat availability of 200 meters on each side of the route (160 acres per mile), this would translate to a potential reduction of 2,400 acres, or approximately 4 percent of the 53,435 acres of winter crucial habitat mapped within the analysis area. However, the this mapped habitat is coded as summer, winter crucial and winter habitat on the RMEF map, and includes elevations ranging from 3800 feet to over 6,200 feet including all available aspects and slopes (including north facing cliffs and talus slopes). It is also entirely within the Rager Travel Management area where motorized access is limited as described above. The proposed season of OHV use for the trail network is outside of the critical winter period both inside and outside of the Rager TMA under all action alternatives. Therefore, although these routes are within the polygon shown on the RMEF habitat map as crucial winter habitat, the proposed trails would not be open for use by OHVs during the critical winter period. The impact of these trails on elk habitat would be during the summer use period. The entire 301,575 acre analysis area is coded as summer habitat on the RMEF map regardless of slope, elevation, aspect or terrain features. Using the same assumptions as described above, the 101 miles of trail system (including 13 miles of open roads) could increase impacts to summer habitat on 5 percent of the RMEF mapped summer habitat within the analysis area.

Potential elk calving and deer fawning areas were mapped based on areas in proximity (within ¼ mile) to meadows, aspen and other riparian shrub habitats, where such areas occur on terrain with less than 25% slope. Under this alternative 54 miles of designated routes occur within potential elk calving habitat. Of those 9 miles are on open roads and 45 miles are not on open roads. There is potential for increased traffic on open roads included as part of the OHV trail system as well as on proposed routes that are not on open roads. Assuming a reduction in effective habitat of 200 meters on each side of the route (160 acres per mile), proposed system routes would impact habitat in potential elk calving areas by 8,640 acres or 7 percent of the 115,540 acres available within the analysis area.

This alternative would have a moderate impact to elk compared to Alternatives 1 and 2 because of the amount of road closures, compact trail extent and density. Designation of new motorized routes would result in a decrease in lands greater than ½ mile from a route. As shown in Table

106, Alternative 3 would result in a reduction in amount and distribution of undisturbed security habitat for deer and elk compared to Alternative 1. This alternative would provide a total of 42,514 acres of security habitat in blocks greater than 250 acres in size. Security habitat less than 250 acres in size do not provide the same security cover advantages present in larger security area blocks, but they would occur on USFS managed land on 2,634 acres.

Alternative 4

Disturbance and Off-road Motor Vehicle Access

Alternative 4 would alter the current pattern of disturbance from unregulated cross-country motor vehicle access, user-created trails, and use of closed roads because of the rehabilitation and concealment proposed at 106 sites on user created routes, 8 sites on decommissioned roads and 163 sites on closed roads. This treatment would reinforce existing closures. However, this alternative would also increase the length of legally open motorized routes by 81 miles. This alternative would provide a system of designated routes intended to provide a legal, planned, designed, engineered and maintained series of routes for motorized use. This should reduce the level of traffic on existing unauthorized or unwanted user-created routes. A regulated trail network providing approximately 81 miles of new motorized trails and up to 76 miles of roads converted to trails for a total of 158 miles in the designated trail system would be established. The trail systems would be linked with shared use roads, including 53 miles which would be designated as connecting routes for the trail network. Refer to Chapter 2 for a detailed description of each alternative. It is projected that motorized use would increase approximately 2 to 5 percent per year as the OHV trail system develops and becomes more widely known to users.

Open road and trail densities on National Forest system lands would increase in some watersheds as shown in Table 104. Open road densities would exceed Forest Plan guidelines of 3.0 mi/mi2 in General Forest allocation on 6 of the 31 subwatersheds in the analysis area (Jackson Creek, Elliot Creek, Lower Big Summit Prairie, Porter Creek, Lower Marks Creek and Upper Marks Creek). Road density in one subwatershed would be brought to the 3.0 mi/mi^2 level (Howard Creek; see Table 109). Mixed use by passenger cars, industrial traffic and OHVs would occur on 659 miles of operational maintenance level 2 roads. Motorized use other than by OHVs would continue to occur on 140 miles of highway legal only (maintenance level 2 to 5) roads. This alternative would likely impact elk to a greater degree than Alternatives 1, 2 or 3. While more road closure reinforcements are proposed than the other action alternatives, the design of the trail system impacts more acreage and results in less undisturbed habitat greater than ½ mile from an open road. There would also be fewer acres of security habitat compared to the other action alternatives. One benefit however, is a designated OHV system more capable of reducing unauthorized use in other areas due to its more extensive and varied recreational opportunities. This alternative may also be more likely to be of sufficient size to handle expected increases in future use, and thus may have a higher probability of preventing future proliferation of unauthorized or user-created trails.

Table 109. Subwatersheds with Open Road and Trail Density at or above 3 miles/sq. mile in General Forest, Alternative 4 combined with road closures proposed in other projects.

Watershed	Subwatershed	Management Area – miles/sq. miles
Deep Creek	Jackson Creek	3.0 GF
Upper North Fork Crooked River	Elliot Creek	3.01 GF
	Howard Creek	3.0 GF
	Lower Big Summit Prairie	3.31 GF
	Porter Creek	3.27 GF
Upper Ochoco Creek	Lower Marks Creek	3.22 GF
	Upper Marks Creek	3.27 GF

Distance banding analysis of the combination of existing open roads (based on operational maintenance level) and proposed trails indicates that there would be a total of 43,085 acres of National Forest lands greater than 800 m (1/2 mile) from an existing road. This represents approximately 14% of the analysis area (a 3% reduction compared to existing condition). Of these, 41,132 acres occur in patches greater than 250 acres in size, or 95% of the total security area more than ½ mile from an open road. Security areas in patches greater than 250 acres are distributed across all nine watersheds (and 24 of 31 subwatersheds) within the analysis area. The subwatersheds that did not contain elk security in patches greater than 250 acres are Drift Canyon (in Lower Beaver Creek), Middle Rock Creek (in Rock Creek), Lower Big Summit Prairie and Porter Creek (in Upper North Fork Crooked River), Jackson Creek and Little Summit Prairie Creek (in Deep Creek), Lower Marks Creek (in Upper Ochoco Creek). In contrast, 129,385 acres (43 percent) of the project area would be within 200 m (660 feet) of an open road or motorized trail. These high-disturbance zone acres are distributed across all nine watersheds (and 30 of 31 subwatersheds) in the analysis area. Within these areas elk would continue to experience high levels of disturbance from motorized use. It is assumed that lands within the 200 m (660 foot) zone are unavailable for consistent elk use as cover or foraging areas during daylight hours when motorized traffic is more likely to occur.

Rocky Mountain Elk Foundation (RMEF) has mapped elk habitat at a State by State scale. This habitat map may be too coarse of a scale to predict high use areas at the local level. However, the alternative was compared to the RMEF map, particularly areas identified as “crucial.” Under this alternative, 38 miles of designated routes occur within RMEF’s Crucial Winter Habitat including routes both on and off of existing open roads. This represents 18% of the total designated route miles under this alternative. Assuming a reduction in habitat availability of 200 meters on each side of the route (160 acres per mile), this would translate to a potential reduction of 6,080 acres, or approximately 11 percent of the 53,435 acres of winter crucial habitat mapped within the analysis area. However, the this mapped habitat is coded as summer, winter crucial and winter habitat on the RMEF map, and includes elevations ranging from 3800 feet to over 6,200 feet including all available aspects and slopes (including north facing cliffs and talus slopes). It is also entirely within the Rager Travel Management area where motorized access is limited as described above. The proposed season of OHV use for the trail network is outside of the critical winter period both inside and outside of the Rager TMA under all action alternatives. Therefore, although these routes are within the polygon shown on the RMEF habitat map as crucial winter habitat, the proposed trails would not be open for use by OHVs during the critical winter period. The impact of these trails on elk habitat would be during the summer use period. The entire 301,575 acre analysis area is coded as summer habitat on the RMEF map regardless of slope, elevation, aspect or terrain features. Using the same assumptions as described above, the 212 miles of trail system (including 53 miles of open roads) could increase impacts to summer habitat on 11 percent of the RMEF mapped summer habitat within the analysis area.

Potential elk calving and deer fawning areas were mapped based on areas in proximity (within ¼ mile) to meadows, aspen and other riparian shrub habitats, where such areas occur on terrain with less than 25% slope. Under this alternative 102 miles of designated routes occur within potential elk calving habitat. Of those 31 miles are on open roads and 70 miles are not on open roads. There is potential for increased traffic on open roads included as part of the OHV trail system as well as on proposed routes that are not on open roads. Assuming a reduction in effective habitat of 200 meters on each side of the route (160 acres per mile), proposed system routes would impact habitat in potential elk calving areas by 16,320 acres or 14 percent of the 115,540 acres available within the analysis area.

This alternative would have the highest impact to elk compared to Alternatives 1, 2 and 3 because of the extensive trail system it proposes. The designation of new motorized routes would result in a decrease in lands greater than ½ mile from a motorized route. As shown in Table 106, Alternative 4 would result in a reduction in amount and distribution of undisturbed security habitat for elk compared to Alternatives 1, 2 and 3. This alternative would provide a total of 41,132 acres of security habitat in blocks greater than 250 acres in size. Security habitat less than 250 acres in size do not provide the same security cover advantages present in larger security area blocks, but they would occur on USFS managed lands on 1,953 acres.

Effects Common To All Action Alternatives

Off-road Motor Vehicle Access

Unregulated cross-country motorized travel including user created trails across the analysis area is expected to be reduced as a result of provision of a designated system of trails and rehabilitation and concealment work at intersections of the proposed trail system with user created, decommissioned and closed roads. The extent of this relief from unauthorized travel likely depends to some extent on the amount and diversity of opportunities provided. In other words, a small-sized trail system may not be as effective in providing alternative riding areas compared to a more extensive system. On the other hand, some unauthorized use may continue in some areas of the forest regardless of the provision of a designated system. In addition to the provision of alternate riding areas, the action alternatives are expected to result in less motorized disturbance to big game animals in specific locations where existing road closures are reinforced and where unwanted user-created trails are rehabilitated. The increase in law enforcement presence that comes with a designated trail system, may reduce violation of unauthorized routes in proximity to the trail system, but is not likely to affect the level of compliance elsewhere in the analysis area.

Cumulative Effects - Big Game

Implementation of the Travel Management Rule of 2005 is a reasonably foreseeable action. The Deschutes and Ochoco Travel Management Plan now has a signed decision and implementation of the plan will occur over the next few years. Under the forest-level travel management plan motorized use will be restricted to designated OHV trail systems and those Level II roads open for vehicular travel. Law enforcement actions would likely encourage compliance through education in the first couple years although it is unknown what level of non-compliance may occur initially. In the long-term, there would be reduced disturbance due to anticipated restriction of motorized use cross-country and on closed roads.

Projects that may have effects that would combine with proposed alternative effects are displayed in Table 6.

Alternative 1

The discussion of cumulative effects for Alternative 1 is the result of effects from past and present actions that have contributed to the current condition of motorized use and hiding cover in the analysis area, and how they combine with effects of the No Action alternative. Land management actions include commercial timber harvest entries, small tree thinning, prescribed fire, wildfires, wildlife habitat enhancements such as riparian restoration, water developments, and commercial and personal use firewood removal. Fuel and vegetation management actions have left some areas with improved forage conditions and reduced cover. Timber management has left behind a footprint of road systems built to extract wood products. Implementation of Alternative 1 would leave existing routes that are open on the ground in their current condition and enforcement of the new Travel Management Plan would be based largely on user compliance with the Motor Vehicle Use Map (MVUM). Legal use by OHVs would be confined to open mixed-use roads within the analysis area.

All Action Alternatives

The Canyon and Spears Vegetation Management EISs have recently been implemented, while Howard Elliot Johnson and Jackson are currently in the implementation phase. These projects include management in areas that overlap the Ochoco Summit OHV project area. Approximately 70,000 acres of vegetation and fuels management have been proposed for treatments including commercial thinning, small diameter thinning and prescribed burning. Vegetative treatments may require the construction of temporary roads to access units and extract wood products. Temporary roads are typically in place for several years and then closed at the completion of all harvest associated activities. Currently closed roads may also have to be used for haul routes during timber harvest operations and are generally returned to closed status following timber sale operations. Collectively, these actions would have a temporary short-term impact on road densities. In addition, the vegetation treatments would likely result in a reduction in the amount of big game hiding cover and potentially increased human access due to removal of small trees and woody debris. There is a potential cumulative impact of disturbance to big game animals that may be utilizing hiding cover adjacent to active logging operations, from additional disturbance related to use of OHV trails in those areas. Over the short term, increased motorized route densities as compared to the existing condition may result in an increase in legal and illegal harvest of deer and elk because of more vehicular access. In addition, effects of human activity and reduction of cover associated with implementation of the vegetation and fuels management projects may combine with effects from proposed establishment of new motorized routes in limiting the amount or effectiveness of security habitat in the short term. In the long-term however, road closures included in some of these vegetation and fuels management projects would reduce the network of open motorized routes within those project areas, potentially reducing the negative impacts from construction of the proposed trails within the project areas where road closures are implemented.

Deschutes and Ochoco Travel Management Plan now has a signed decision and implementation of the plan will occur over the next few years. The Travel Management Plan has done the following:

- Designate specific conditions, if any, under which existing routes or areas will continue to provide for sustainable motorized use considering a variety of societal and resource factors
- Identify existing roads, trails, and areas that will continue to support sustainable motorized use

- Identify potential motorized routes and/or areas that could be added to the forests and grasslands transportation system for motorized use.

After implementation of the forest-level Travel Management Plan, in the long-term, there would be reduced disturbance due to anticipated restriction of motorized use cross-country and on closed roads.

All action alternatives would develop a designated OHV trail system to replace the current unregulated use that is presently occurring. Under implementation of the 2005 Travel Management Rule and the forest-level Travel Management EIS, on-the-ground motorized route densities would decline from the current levels as a result of closing user created trails not included in the designated OHV system, enforcement of existing road closures and prohibiting cross-country travel. Roads Analysis has been conducted for all subwatersheds that overlap the proposed alternatives. The Roads Analysis process helps to prioritize roads for closure, reinforcement of existing closures or decommissioning. Refer to the Roads Analysis Report in the Project File. Implementation of the forest-level Travel Management Plan, in combination with closures and restoration proposed under this project would benefit mule deer and elk in the project area, because portions of this analysis area are heavily roaded with many closed or decommissioned roads that area still receiving motorized use, with relatively small percentages of elk security habitat. Refer to Table 104 and Table 106.

Private land ownership in the analysis area includes rural ranch and timberland. These lands do provide quality big game habitat because of restricted human access, and slope position which provides productive soils and water availability. While the industrial timberland acreage has been managed for timber harvest, big game hiding cover and secure habitat acreage is available. Consequently, the potential for development of an OHV system on National Forest lands to displace elk to private land has been considered in this analysis. Table 110 shows the amount of secure cover available to deer and elk on USFS managed land within 2 miles of private land. This measure was used as an estimate of capability to retain elk on federal land and not cause displacement to private land. This analysis assumes that elk would be more likely to find secure cover and not be displaced to private land where forested stands exceeding 40% crown closure occur at a distance of more than ½ mile from a motorized route and where this occurs within 2 miles of private land. As can be seen in Table 110 the difference between alternatives detected by this measure is very small (up to a 4 percent reduction between Alternatives 1 and 4). This is because of the relatively large network of existing open motorized routes and the abundance of open vegetation such as meadows and scabland that affect the distribution of forested cover within two miles of private land. Alternative 2 shows slightly more (up to 2% more) forested cover in proximity to private land compared to the other action alternatives due to the lack of interconnected loops on the west end in that alternative. These west end loops in Alternatives 3 and 4 are in a forested setting within 2 miles of private land, and thus they affect the amount of undisturbed forested cover in proximity to private land.

Table 110. Comparison of Alternatives for Hiding and Thermal Cover (more than ½ mile from open motorized route and within 2 miles of private land).

Cover Type	Alt 1	Alt 2	Alt 3	Alt 4
Hiding cover (40 to 70% cc)	11,847	11,558	11,465	11,285
Thermal cover (70+ % cc)	9,197	9,089	8,978	8,915
Total cover (40 - 100% cc)	21,044	20,647	20,443	20,200

Table 111 displays a summary of the predicted effects of the proposed alternatives on big game key indicators. No trails or areas are proposed in Winter Range or General Forest Winter Range, so there are not differences in these areas between the alternatives.

Table 111. Summary Comparison of Key Indicators for Big Game by Alternative.

Key Indicators	1	2	3	4
National Forest road and motorized trail density in mi/mi2 averaged for 31 subwatersheds in GF, GFWR and WR combined	1.83	2.09	2.01	2.17
National Forest road and motorized trail density in mi/mi2 in General Forest averaged across 31 subwatersheds	1.91	2.23	2.13	2.31
National Forest road and motorized trail density in mi/mi2 in Winter Range + GFWR averaged across 31 subwatersheds (without credit for gate closure mitigations)	1.41	1.41	1.41	1.41
National Forest road and motorized trail density in mi/mi2 in Winter Range + GFWR averaged across 31 subwatersheds (with credit for seasonal closure, MVUM)	0.9	0.9	0.9	0.9
Number of 6th-field subwatersheds with 3.0 miles or more of roads and trails open for motorized use in General Forest	2	4	2	6
Acres of National Forest land > than 1 mile from an open motorized route in the project area and percent of analysis area	10,779 (3.6%)	10,411 (3.5%)	10,411 (3.5%)	10,411 (3.5%)
Acres of National Forest land > than 1/2 mile from an open motorized route and percent of analysis area	49,187 (16.3%)	44,345 (14.7%)	45,118 (15.0%)	43,059 (14.6%)
Acres of National Forest land < than 660 feet (200 m) from an open motorized route and percent of analysis area	115,127 (38.2%)	125,745 (41.7%)	123,036 (40.8%)	129,390 (42.9%)
Acres elk security habitat (>1/2 mile from open motorized route) in blocks at least 250 acres in size and percent of analysis area	47,969 (15.9%)	42,460 (14.1%)	42,514 (14.1%)	41,132 (13.6%)
Acres elk security habitat (>1/2 mile from open motorized route) in patches less than 250 acres in size and percent of analysis area	2,208 (0.7%)	1,914 (0.6%)	2,634 (0.9%)	1,953 (0.6%)
Total Elk Security areas regardless of patch size and percent of analysis area	50,177 (16.6%)	44,374 (14.7)	45,148 (15.0%)	43,085 (14.3%)
Miles of trail in RMEF Crucial Winter Range (MAPS)	0	30.8	15.5	37.7
Miles of trail in calving/fawning habitat not on open roads	0	54.1	44.5	70.4
Acres of secure cover within 2 miles of private land	21,044	20,647	20,443	20,200

Viability Assessment for Rocky Mountain Elk and Mule Deer

Background: Mule deer and Rocky Mountain elk were chosen as terrestrial management indicator species (MIS) for populations of big game and their habitat (LRMP 4-245). A great deal of research and scientific literature on the Rocky Mountain elk was generated from studies conducted in the Blue Mountains. Research conducted at the Starkey Experimental Forest beginning in the 1980's on the Rocky Mountain elk has defined much of the science and current understanding of elk in the Blue Mountains of Oregon.

Existing Condition: Rocky Mountain elk and mule deer occur in populations across the State of Oregon, and across Ochoco National Forest. Deer and elk may utilize the watershed throughout the year during below normal snow years, but generally use the high elevation areas primarily as summer range, wintering on the lower elevation USFS managed lands and on private lands. Within the Forest boundary, the Ochoco Summit analysis area contains 14,442 acres within the General Forest (GF), 11,083 acres within General Forest Winter Range (GFWR) and 14,442 acres within the Winter Range (WR) LRMP allocations.

The project area lies within one Oregon Department of Fish and Wildlife (ODFW) management zone, the Ochoco Wildlife Management Unit (WMU). The Ochoco WMU contains 47% private lands and 53% public lands. The estimated 2011 population for elk and deer was 3900 elk and 15,400 deer. The management objective (MO) is the number of elk and deer that ODFW manages for to prevent depletion of big game animals and to provide optimum recreational and aesthetic benefits for the public (quality hunting and wildlife viewing opportunities in the present and in the future). In the Ochoco WMU the MOs are 4,600 elk and 20,500 deer. Mule deer populations have been generally declining across the Western States. This decline is evident in the Ochoco WMU as well. The mule deer MO was met in 1988, but has not been met since. Population estimates within the WMU have decreased from 18,500 in the late 1990's to 15,400 in 2011, but was estimated at 16,000 in 2010. The elk population steadily increased from the 1970's through the early 2000's, exceeded the 4,300 elk target starting in 1999, and has been holding fairly steady in recent years (between 3,900 and 4,700 between 2006 and 2012) with a slight downward trend.

Effects Common to All Alternatives: The potential effects are described in detail above. This project would increase motorized route density and would reduce the effectiveness of security cover within the project area. For these reasons the project may result in localized redistribution of big game, particularly of elk, from less secure locations into more secure locations (at least in the short term). The project does not increase motorized route density in winter range, and does propose reinforcement of closures on unwanted trails and closed roads to ensure consistency with the Ochoco National Forest Plan standards and guidelines for deer and elk.

Conclusion: Both species have a demonstrated harvestable surplus across the State of Oregon and within the Ochoco WMU. Oregon Department of Fish and Wildlife monitors these populations annually and sets harvest levels based on the results of annual monitoring. Given the widespread distribution of these species and their habitat across the Forest and WMU, and the potential effects described above (this project would increase motorized road and trail density, and reduce security habitat) the project's overall direct, indirect and cumulative effects may result in a small negative trend particularly in proximity to routes that are more than ½ mile from existing open roads. However this impact becomes unmeasurable beyond the one mile distance band from any proposed trails. Given the existing motorized route density, the relatively small change in motorized route density and the presence of demonstrated harvestable surplus populations of elk and mule deer, the continued viability of these species is expected to occur on Ochoco National Forest.

Bald Eagle

The bald eagle was selected as a management indicator species because it was a Threatened species. The bald eagle was previously discussed in the Threatened Endangered and Sensitive Species section. Please refer to the TES section for details on the northern bald eagle and the effects determination.

Golden Eagle

The golden eagle was chosen as a terrestrial management indicator species (MIS) for cliff, talus or cave habitat (LRMP 4-245).

Gilligan et al. (1994) describes the golden eagle as an uncommon to fairly common summer resident in open country east of the Cascade Mountains and a very uncommon summer resident high in the Cascades. Marshall et al. (2003) lists them as common to uncommon year round resident of all counties east of the Cascade Range, with the highest nesting densities in Lake, Harney and Malheur Counties. The golden eagle nests in open large (greater than 30 inches in diameter) live ponderosa pine or cliff ledges that support its 3-10 foot tall nest (Marshall et al. 2003). The Natural Heritage program rank golden eagles as S4, Apparently Secure (NatureServe 2009). NatureServe (2009) listed the following as the major threats golden eagles experience: (1) powerline electrocution because wings can span phase-to-phase or phase-to-ground wires (Biosystems Analysis 1989), (2) poison intended for coyotes, (3) occasional shootings, and (4) habitat loss to agriculture and suburban land uses.

Existing Condition

Wildlife observation records list 48 golden eagle sightings across the analysis area, including 2 nests. The majority of the district records are from wintering birds (October through February). However a number of sightings on the Forest occurred between March and August and these may be associated with nesting territories that have not been discovered. The State database (ODFW, 2007) lists 1 site record within the analysis area, the area was checked in 2002, 2005, 2006 and 2007 and no nests were located. Two additional nest locations in the district records have been monitored, one was checked in 2006, 2007, 2011 and 2012 and no nest was confirmed. The other nest has been confirmed and was found to successfully fledge young in 2004 and 2005. This nest was checked in 2012 and no sign of occupancy was found.

Viability Assessment for Golden Eagle:

Background: Golden eagles inhabit shrub-steppe, grassland, juniper, and open ponderosa pine, and mixed conifer/deciduous habitats. They forage in a variety of habitat types and successional stages, preferring areas with an open shrub component that provides food and cover for prey. Suitable nesting and foraging habitat can be found in mountains, canyons, and rolling hills. Of 506 occupied nests in Oregon in 1982, 35% were in mature trees and 65% on ledges along rims and cliffs (Isaacs and Opp 1991). Nest trees are typically large live ponderosa pine with sturdy open branching and a trunk dbh >30 in. Golden Eagles have large breeding territories ranging 10-40 sq.mi. Nest territories may contain several alternate nests. Forage on a variety of prey species including: jackrabbit, cottontail, California and Belding's ground squirrels, marmots, woodrats, small mammals, fresh carrion, and a variety of birds species (Marshall 2003). This species has a holartic distribution. In the North America this species breeds from Alaska and Canada south to Central Mexico. In the U. S. it occurs primarily west of the east slope of the Rocky Mountains. In Oregon, golden eagles are common to uncommon year round residents in all counties east of the Cascade Range (Marshall, 2003).

The population trend in Oregon is unknown. In 2011 a state-wide effort is underway to determine the status of historic nesting territories across the State of Oregon. Golden Eagles counted during the mid-winter Bald Eagle survey in Oregon for 1992-2001 have varied from 79 to 128 and averaged 97 (Isaacs 2001). The populations of resident golden eagles in the northern part of the Great Basin, particularly in Idaho and Northern Utah, have shown indications of a decline (Marshall, 2003). The Natural Heritage program rank golden eagles as S4, Apparently Secure (NatureServe 2009). NatureServe (2009) listed the following as the major threats golden eagles experience: (1) powerline electrocution because wings can span phase-to-phase or phase-to-

ground wires (Biosystems Analysis 1989), (2) poison intended for coyotes, (3) occasional shootings, and (4) habitat loss to agriculture and suburban land uses.

Existing Condition: On the Ochoco National Forest, including Crooked River National Grassland, there are records for 147 historic nesting sites. The majority of the nests are associated with extensive rimrock habitat present in Jefferson County, as noted below. Of 147 historic sites forest-wide, only 12 occur in Crook County. Sightings within the analysis area are described above.

Of the occupied nests studied by Isaacs and Opp in 1982, 65% were on rock ledges. A forest-level analysis was conducted in 2011 using updated GIS data on rock features. The output from this analysis reflects the majority of rock features with potential nesting habitat. Rock features identified in the GIS data are those that are of sufficient size to be detected from aerial photographs. The rock categories included in estimating potential nesting habitat for this species included the following: rimrock, rock, rock/limestone, rocky knob, talus, talus/rocky knob, talus/rimrock. The GIS data layer is estimated to be 80% accurate in detecting rock features with cliff faces that have any potential as nesting sites. Some small cliffs may have been overlooked in the aerial photo interpretation, and some rock features identified as potentially having cliff habitat, may not be suitable for nesting sites. However, this data is expected to be representative of the majority of suitable nesting substrate and of sufficient accuracy for a comparison of potential rock habitat within the project area and across the landscape at a forest-wide scale. From this analysis it was estimated that at the forest level there are approximately 18,838 acres of rock habitat with potential cliff nesting habitat (2,149 acres within the project area). There are a total of 34 watersheds (5th field HUC) on Ochoco National Forest. Potential cliff nesting habitat is distributed within all 34 of these watersheds, though some watersheds (Crooked River Grassland, Headwaters Deschutes River, Lake Billy Chinook, Lower Metolius River and Willow Creek) have substantially more cliff habitat than other watersheds across the Forest.

Golden eagle nests that are not on cliffs are typically on large ponderosa pine trees or snags in open stands, or on scattered individual large pine trees in otherwise open habitat such as rocky canyons, shrub/steppe or grassland settings. These individual scattered pines may occur in a variety of plant associations including juniper woodland, juniper steppe or xeric ponderosa pine.

Effects Common to All Alternatives: No alternative would modify potential cliff nesting habitat. No alternative would remove scattered large ponderosa pine trees that could serve as nest sites for golden eagles. No alternative would remove trees greater than 21” dbh (that could serve as future nest trees) or snags, other than incidentally for safety along trails or at trailheads or staging areas.

Conclusion: This project area is likely to have a relatively minor influence on potential nesting and foraging habitat for golden eagles due to a general lack of extensive low to mid elevation cliff features and limited habitat for primary prey species within proximity to any proposed routes or facilities. For these reasons implementation of any alternative proposed in the Ochoco Summit Project will not contribute to a negative trend in viability on the Ochoco National Forest for the golden eagle.

Prairie Falcon

The prairie falcon was chosen as a terrestrial management indicator species (MIS) for cliff, talus or cave habitat (LRMP 4-245). The prairie falcon is also discussed in the section on Raptors under Other Species. Please refer to that section for further details on this species.

Prairie falcons breed throughout the open country east of the Cascades wherever cliffs and outcrops provide opportunities for nesting (Marshall 2003). Prairie Falcons are most common in rimrock country, where they nest, but may travel great distances in search of prey (Marshall 2003, Birds of Oregon). A combination of rimrock or other outcrops and adjacent open country

provides ideal breeding habitat. They winter over much of the breeding range south to Mexico (Marshall 2003).

Existing Condition: District wildlife sighting records list 2 observations within the analysis area. Private forest and rangeland in the analysis area are likely to provide suitable habitat for prairie falcons, where cliff or rimrock faces provide nest sites situated within or near open shrub and grassland habitat. Multiple records for this species are associated with privately owned meadowlands within 1 mile of the Forest boundary, more than 2 miles from the analysis area boundary.

Viability Assessment for Prairie Falcon:

This species breeds from c. British Columbia east to N. Dakota, south to Baja California and Texas. It winters over much of its breeding range south to Mexico (Marshall 2003). They breed throughout the open country east of the Cascades wherever cliffs and outcrops provide opportunities for nesting (Marshall 2003). Prairie Falcons are most common in rimrock country, where they nest, but may travel great distances in search of prey (Marshall 2003). A combination of rimrock or other outcrops and adjacent open country provides ideal breeding habitat. Cliffs need not be large. Denton (1979) found 59% of nest on cliffs less than 100 ft, some as low as 15 ft. The principal requirement is that the nest site be sheltered from above (Bent 1938, Webster 1976). This appears to reflect a need for shade and possibly protection from predators (Marshall 2003).

Grasslands are the preferred habitat although they also occur in less-productive areas dominated by sagebrush. The principal requirement for foraging appears to be low and sparse vegetation that accommodates their foraging style. Prey most often consists of small mammals, usually ground squirrels (Denton 1976, Haak 1982b).

This species occurs in low density and exhibits wide-ranging habits (Marshall, 2003). Densities of 3.9-8.0 breeding pairs/100square miles were found in Wasco and Wheeler counties (Janes 1975). Lardy (1980) found higher average densities in Malheur Co. (9.8-14.0/100sq.mi.). Populations, including those in Oregon, appear to be stable (White 1994).

Existing Condition: District wildlife sighting records list 2 observations within the analysis area. Private forest and rangeland in the analysis area are likely to provide suitable habitat for prairie falcons, where cliff or rimrock faces provide nest sites situated within or near open shrub and grassland habitat. Multiple records for this species are associated with privately owned meadowlands within 1 mile of the Forest boundary, more than 2 miles from the analysis area boundary. Prairie falcon nests have been confirmed at other locations on Ochoco National Forest at low elevation, near the Forest boundary.

A forest-level analysis was conducted in 2011 using updated GIS data on rock features. The output from this analysis reflects the majority of rock features with potential nesting habitat. Rock features identified in the GIS data are those that are of sufficient size to be detected from aerial photographs. The rock categories included in estimating potential nesting habitat for this species included the following: rimrock, rock, rock/limestone, rocky knob, talus, talus/rocky knob, talus/rimrock. The GIS data layer is estimated to be 80% accurate in detecting rock features with cliff faces that have any potential as nesting sites. Some small cliffs may have been overlooked in the aerial photo interpretation, and some rock features identified as potentially having cliff habitat, may not be suitable for nesting sites. However, this data is expected to be representative of the majority of suitable nesting substrate and of sufficient accuracy for a comparison of potential rock habitat within the project area and across the landscape at a forest-wide scale. From this analysis it was estimated that at the forest level there are approximately 18,838 acres of potential cliff nesting habitat (2,149 acres within the project area). There are a total of 34

watersheds (5th field HUC) on Ochoco National Forest. Potential cliff nesting habitat for is distributed within all 34 of these watersheds, though some watersheds (Crooked River Grassland, Headwaters Deschutes River, Lake Billy Chinook, Lower Metolius River and Willow Creek) have substantially more cliff habitat than other watersheds across the Forest. Rock habitat with potential for cliff nesting species occurs within nine watersheds in the project area, with the majority occurring in Upper Ochoco Creek (578 acres), Rock Creek (388 acres) and Deep Creek (329 acres). Proposed alternatives increase the amount of area within ½ mile of a motorized route within these watersheds as follows: Upper Ochoco Creek Alt. 2 by 18%, Alt. 3 by 20%, Alt. 4 by 21%; Rock Creek 12% all action alternatives; Deep Creek Alt.2 by 38%, Alt. 3 by 36%, Alt. 4 by 39%. However, rock habitat is not uniformly distributed across each watershed, so increases in acreage in proximity to motorized routes at a watershed scale does not necessarily reflect a direct increase in potential for disturbance.

Effects Common to All Alternatives: No alternative would modify potential cliff nesting habitat. There is potential for effects from human disturbance as described above.

Conclusion: This project area is likely to have a relatively minor influence on potential nesting and foraging habitat for prairie falcons due to a general lack of extensive low to mid elevations sheer cliff features within proximity to any proposed routes or facilities. For these reasons implementation of any alternative proposed in the Ochoco Summit Project will not contribute to a negative trend in viability on the Ochoco National Forest for the prairie falcon.

Other Wildlife Species (LRMP)

During the preparation of the Ochoco National Forest Land and Resource Management Plan (USDA 1989), a group of wildlife species were identified as Other Species. These species were selected because their well-being was of interest and therefore specific standards were provided. The species listed in Table 112 were listed in the Ochoco National Forest LRMP.

Table 112. Ochoco National Forest Other Species (LRMP).

Ochoco National Forest Other Species (LRMP)	Habitat	Presence Within The Analysis Area
Antelope	Open country, sagebrush flats	Yes
Raptor Habitat (eagles, hawks, owls, falcons, osprey)	Nest sites/nesting habitat	Yes
Species that use dead and down logs	Snags and logs	Yes
Species that use plant communities	Diversity of PAGs and SS stages	Yes
Species that use springs, bogs and other unique habitat	Seeps, springs, bogs, wetlands,	Yes

Antelope

The LRMP specifies that habitat for antelope (pronghorn) is to be managed in accordance with ODFW Management Objectives. For the Ochoco WMU the Population trend measured as an index using the number of animals per mile, and it was estimated at 3.1 in 2009 and 2.6 in 2010. This trend index was not surveyed in 2011 or 2012. The kid ratio was estimated at 34 kids per 100 does in 2008, at 43 in 2009, at 36 in 2010 and at 34 in 2011. The buck ratio was estimated at 25 bucks per 100 does in 2008, at 35 in 2009, at 36 in 2010 and at 34 in 2011. Percent rifle success was reported at 67% in 2009, at 73% in 2010 and at 76% in 2011. This project does not substantially alter vegetation that would provide primary pronghorn (antelope) habitat. However, as with other hunted big game species, pronghorn are likely to respond to traffic whether on an open road or a trail, and to human presence, whether motorized or not. This species has evolved with running swiftly as a primary means of escaping from predators. Thus, disturbances which are perceived as threatening in the eyes of a pronghorn may generate a fleeing response when

such disturbances occur in suitable and occupied pronghorn habitat. These animals select relatively dry and open sagebrush and upland shrub habitat on gentle slopes. To estimate the relative impact of alternatives on potential pronghorn habitat the length of trail on suitable plant association groups (PAGs) was measured in GIS. The total length of trail proposed under each alternative within juniper steppe, juniper woodland and non-forested areas combined is displayed in Table 113. This represents the relative potential for disturbance to pronghorn in their preferred habitat.

Table 113. Comparison of Alternatives for Length of Trail in Potential Pronghorn Antelope Habitat.

Type of Route	Alt 1	Alt 2	Alt 3	Alt 4
Open Road	No OHV System	16.2	4.9	15.8
Closed Road	No OHV System	8.1	4.8	9.9
Decommissioned Road	No OHV System	2.9	1.3	3.4
"New" Construction	No OHV System	16.3	7.6	19.1
Total OHV Designated Route Miles	No OHV System	43.5 miles	18.6 miles	48.2 miles

Raptors

The term raptors refer to birds of prey, those that kill other animals for meat, and which generally have talons and hooked beaks. Existing condition and potential effects to the northern goshawk, Cooper's hawk, sharp-shinned hawk, red-tailed hawk, prairie falcon and golden eagle are discussed in this section along with other hawks and owls. Refer to the TES Species section for further information on bald eagles. Refer to the MIS Species section for further information on golden eagle and prairie falcon.

Existing Conditions of Raptors

Northern Goshawk

The northern goshawk is the largest member of the accipiter family and is distributed across most of Canada, the northern and western United States, and into Mexico. Reynolds et al. (1978) located goshawk nests in Oregon from 580 meters elevation on the west slopes of the Cascades to 1,860 meters nest site. Reynolds et al. (1992) stated preferred nest stands have a minimum of 40 percent canopy cover and the nest sites within these stands have greater than 60 percent canopy cover. Greenwald et al. (2005) reviewed goshawk nesting data and found that a majority of studies found a selection for stands with greater than 40 percent canopy as suitable goshawk nesting habitat. Vegetation plot data collected from Deschutes National Forest goshawk nest sites showed canopy cover ranging from 49-94 percent (USDA 1993). Foraging areas are typically 4,900-5,900 acres; comprised of a forest mosaic that must support a wide range of suitable prey including ground dwellers or those occurring near the forest floor (Marshall et al. 2003).

Sauer et al. (1996 cited in Wisdom et al. 2000) determined that breeding bird survey data for goshawk was insufficient to determine population trends for any state or physiographic region within the Interior Columbia River Basin because of low detection rates. However, sufficient data was available to indicate a stable trend in numbers between the years 1966-1995 for western North America.

Breeding bird surveys provided insufficient data to determine population trends within any state or physiographic province in the Interior Columbia Basin. However, it is anticipated that goshawk populations on the Deschutes National Forest would decline in response to the loss of habitat due to wildfires over the last 6-8 years. The Oregon Natural Heritage Information Center maintains a list of the most current information available on the distribution and abundance of animals native to Oregon. They rank the northern goshawk population as demonstrably wide-spread, abundant, and secure.

The wildlife sighting database has numerous documented observations of goshawks in the analysis area, including 36 nesting territories (22 on Lookout Mtn R.D. and 14 on Paulina R.D.). Goshawk surveys using broadcasts of recorded calls have occurred in portions of the analysis area in conjunction with vegetation management projects over the course of four decades. Most of the systematic survey records were initiated following implementation of the Regional Forester's Plan Amendment #2 (Eastside Screens) in 1995. However, there are records for goshawks in the analysis area dating back into the 1970s and up to 2010. The level of past survey work conducted to date is dependent on the location and timing of various vegetation management projects within the analysis area over time. Table 114 displays the survey and reproductive history of each known goshawk nesting territory within the analysis area.

Table 114. Reproductive History of Goshawks within the Ochoco Summit Analysis Area.

Post Fledgling Area	Year of last confirmed nesting	Year of first nesting record	Number of documented nest trees	Number of documented nest cores	Number of nest attempts with young, years surveyed
LOM 2497	2007	1997	2	1	Active nest 5 of 7 years checked
LOM 1169	2011	1992	4	2	Active nest 5 of 7 years checked
LOM 9902	1999	1999	1	1	Active nest 1 of 4 years checked
LOM 0265	2009	1981	2	1	Active nest 2 of 2 years checked
LOM 1168	2003	1995	3	2	Active nest 2 of 4 years checked
LOM 5108	2009	2004	3	1	Active nest 3 of 3 years checked
LOM 2494	2010	1996	2	1	Active nest 3 of 4 years checked
LOM 0242	1992	1992	1	1	Active nest 1 of 3 years checked
LOM 9603	2003	1996	4	1	Active nest 2 of 2 years checked
LOM 2496	2003	1999	2	1	Active nest 2 of 2 years checked
LOM 0089	2007	2007	1	1	Active nest 1 of 1 years checked
LOM 0253	1992	1922	1	1	Active nest 1 of 1 years checked
LOM 1262	1995	1995	2	1	Active nest 1 of 1 years checked
LOM 1256	1995	1995	2	1	Active nest 1 of 3 years checked
LOM 1286	2011	1995	2	1	Active nest 2 of 5 years checked
LOM 1271	1995	1955	1	1	Active nest 1 of 2 years checked
LOM 1222	2009	1995	2	1	Active nest 3 of 3 years checked
LOM 1285	1995	1995	2	1	Active nest 1 of 2 years checked
LOM 1219	2009	1995	2	1	Active nest 3 of 4 years checked

Table 114. Reproductive History of Goshawks within the Ochoco Summit Analysis Area.

Post Fledgling Area	Year of last confirmed nesting	Year of first nesting record	Number of documented nest trees	Number of documented nest cores	Number of nest attempts with young, years surveyed
LOM 0249	1998	1981	2	2	Active nest 2 of 6 years checked
LOM 5113	2009	2009	1	1	Active nest 1 of 1 years checked
LOM 1172	2009	2009	1	1	Active nest 1 of 1 years checked
LOM 0244	2012	2010	3	1	Active nest 2 of 2 years checked
LOM 5114	2011	2011	2	1	Active nest 1 of 1 years checked
PAU 3263	2002	1997	2	1	Active nest 2 of 3 years checked
PAU 1846	1989	1989	1	1	Active nest 1of 2 years checked
PAU 3243	1999	1998	1	1	Active nest 1 of 6 years checked
PAU 3270/3271/3427	2004	2001	3	1	Active nest 3 of 3 years checked
PAU 3260/3261/3262	2002	1999	3	1	Active nest 2 of 5 years checked
PAU 3252	2002	1999	2	1	Active nest 2 of 5 years checked
PAU 3256	2002	1998	1	1	Active nest 2 of 3 years checked
PAU 2367/3247/3248	2002	1998	3	2	Active nest 5 of 5 years checked
PAU 3266/3431	2002	2000	2	1	Active nest 3 of 4 years checked
PAU 3259	2002	1998	1	1	Active nest 3 of 5 years checked
PAU 2370/3272/3428	2002	1996	4	2	Active nest 5 of 7 years checked
PAU 2368/3244	2005	1998	2	2	Active nest 4 of 6 years checked
PAU 3432/3433	2010	2000	3	1	Active nest 3 of 4 years checked
PAU 3251/3438	unknown	unknown	2	1	Active nest 0 of 4 years checked

Sharp-shinned and Cooper's Hawks

Sharp-shinned and Cooper's hawks are both ranked S4, Apparently Secure in the state of Oregon (NatureServe 2009). For sharp-shined hawks small declines may be attributed to loss of preferred young dense forest stands in boreal forest due to logging, and pesticides (NatureServe 2009). The use of pesticides on farmlands and loss of habitat are the major threats for Cooper's hawks (NatureServe 2009).

Both species are closely associated with deciduous and mixed coniferous forests, open woodlands, and riparian woodlands. They can occur in large forests but are more likely to be found near forest edges and clearings near lakes or streams. In a study in eastern Oregon,

Reynolds (1983) found nesting sharp-shinned hawks to use 25-50 year-old even-aged conifer stands while Cooper's hawks used 30-70 year old even-aged conifer stands with somewhat larger and more widely spaced trees than those stands used by sharp-shins. Reynolds also reported the mean distance between the nearest nesting neighbors was 4.1 km. (2.5 miles) for sharp-shins and 4.7 km (2.8 miles) for Cooper's hawks. Both species are adapted to catch avian prey but each would also capture small mammals, lizards and various large insects and amphibians (Johnsgard 1990). Home range estimates were 1,590 hectares (3,975 acres) for Cooper's hawks and 460 hectares (1,150 acres) for sharp-shin hawks in Oregon (Reynolds 1983). Reynolds et al. (1983) studied accipiter nest sites in eastern Oregon and determined the mean canopy cover for sharp-shinned nests was 68 percent and 64 percent for Cooper's hawks, although the range extends from 20-95 percent for sharp-shins and from 15-100 percent for Cooper's. Both species select nest placement well up in the tree canopy for nest concealment or shading during warm temperatures (Moore and Henny 1983; Reynolds et al. 1983). Dense vegetation provides screening cover and physical protection from predators and predation may account for the high foliage density in the immediate vicinity of the nests of sharp-shins and Cooper's hawks (Reynolds et al. 1982).

The wildlife sighting database lists 20 sightings and 11 nests for Cooper's hawks in the analysis area. While there are 8 recorded sharp-shinned sightings and 1 documented sharp-shinned nest within the analysis area. The sightings came from general observations during other forest management activities as well as during surveys for northern goshawks. There is considerable overlap of habitat for each species and habitat. Formal surveys have not been conducted specifically for either species and reported observations are the results of random observations and responses from conducting northern goshawk surveys.

Red-tail Hawk

Red-tail hawks are widely distributed across North America and winter from southern Canada south into the United States and Central America. Red-tail habitat consists of large snag or deformed trees on forest edges, open country interspersed with forests, and suitable perches (trees, utility poles, outcrops etc). They are known to use agriculture land, clearcut harvest units, grasslands, woodlands and alpine environments (Marshall et al. 2003). It uses any habitat that has perches to hunt from and open enough to capture its prey on the ground. Small mammals, such as rabbits, hares, and mice provide the bulk of their diet. They are also known to capture birds, reptiles, and amphibians. Red-tails use a wide variety of structures for nests, including trees, utility poles and cliffs (Marshall et al. 2003). They place their nests higher in trees than other raptors, and generally select larger trees or smaller deformed trees where branch structure supports this higher placement. The red-tail hawk has increased in numbers and expanded its range since Euro-American settlement (Marshall et al. 2003). Red-tailed hawks are ranked S5, Secure in Oregon (NatureServe 2009).

Red-tail hawks are common and widely scattered on the Forest. District wildlife sighting records list numerous red-tail hawk observations and 12 nests scattered across the analysis area. Private forestlands in the analysis area are likely to provide suitable habitat for red-tail hawks, where overstory trees provide nest sites situated within open forests and grasslands.

Golden Eagle

Refer to the MIS section for the discussion of golden eagles.

Osprey

Ospreys are good biological indicators of ecosystem health, because they are long-lived and are the top predator of aquatic food webs (USGS 2005). Various fish species comprise 99 percent of their diet. Ospreys dramatically declined in abundance through the mid-1970s, as a side effect of

pesticide use, but have since recovered and become a common nesting species along the Columbia and Willamette waterways in western Oregon (USGS 2005). Osprey nesting habitat consists of forests that have large live or dead tree components for nesting near bodies of fish bearing water. They nest within two miles of fish bearing bodies of water and generally nest in larger broken top live trees or snags, but also utilize utility poles, man-made Canada goose nest boxes, channel markers and other manmade structures where natural structures are lacking (Marshall et al. 2003). The primary habitat requirements of osprey include a dependable source of fish that can be captured near the surface and an elevated nesting platform within a few kilometers of their food supply. Ospreys are migratory, typically arriving in the area in April and May and they stay into early autumn until fall migration. While the pair would mate for life, they migrate separately and re-unite at their nest site the following spring. The birds winter in central California south into Central and South America. They are currently ranked as S4 in Oregon, Apparently Secure (NatureServe 2009). NatureServe (2009) listed the following as major threats to ospreys: (1) pesticides, (2) gunshots, (3) steel traps, (4) impact with or electrocution by high-tension wires, and (5) being caught or drowned in nets (Wiemeyer et al. 1980, cited in Henny and Anthony 1989).

There are 7 known osprey nests located in the analysis area or adjacent to it. These are scattered across the analysis area in proximity to fish bearing streams, ponds and reservoirs. There is not a concentration of nests within the analysis area like there are along some of the more productive water bodies in Central Oregon.

Some of the nesting ospreys occupy territories that include high recreational use or residential areas, such as near Walton Lake Campground, Allen Creek Reservoir and Marks Lake. Other pairs have nests in more remote locations such as along the North Fork of the Crooked River and at various small ponds. It is assumed that where there is high recreational use in osprey territories, nests have either been abandoned or if in use, ospreys have become tolerant or habituated to the activity.

Prairie Falcon

Refer to the MIS section for the discussion of prairie falcons.

Other Hawks

Other species of hawks are found in the analysis area, particularly during migration. Some occupy habitat in the area during nesting season, while others may winter in the area or pass through during spring and fall migration.

District wildlife sighting records list 3 observations and 1 nest for American kestrel; 3 observations of northern harrier; 2 peregrine falcon sightings; 2 rough-legged hawks scattered within the analysis area. Private forestlands in the analysis area are likely to provide suitable habitat for these raptors that prefer open country dominated by open forest or shrub and grassland habitat.

Long-eared Owl

District wildlife sighting records list 2 records of long-eared owl within the analysis area. Private forestlands in the analysis area are not as likely to provide suitable habitat for long-eared owls, as this species tends to select very dense stands with an abundance of dwarf mistletoe in Douglas fir, where they are adjacent to open forests, shrublands and grasslands.

Great-horned Owl

District wildlife sighting records list 20 records of great horned owls, including 1 nest scattered across the analysis area. Private forestlands in the analysis area are likely to provide suitable

habitat for this species where old hawk nests, hollow trees, caves or buildings provide nest sites situated within a mosaic of open forest or woodland mixed with open areas.

Great Gray Owl

District wildlife sighting records list 3 records of great gray owl observations in the analysis area, all in the vicinity of Lookout Mountain. This species finds suitable nesting habitat where dense stands of timber with broken-topped soft snags occur adjacent to open grassy areas with abundant small mammals (gophers and voles). These conditions are present in portions of the analysis area.

Other Owls

District wildlife sighting records list 4 observations and 1 nest for barred owl; 2 records of boreal owl; two records of flammulated owl; 14 northern pygmy owl records; and 4 northern saw-whet owl records scattered across the analysis area. These species select from a variety of habitat types from low elevation woodlands to high elevation subalpine forests. The analysis area does contain a variety of habitat types capable of supporting a variety of owl species. Private forestlands in the analysis area are likely to provide suitable habitat for flammulated, pygmy and saw-whet owls, but are less likely to have suitable habitat for boreal owls, which typically reside in high elevation stands where spruce and lodgepole pine area common.

Effects to Raptors

There is conflicting science when assessing the human disturbance effects on raptors. Gunnison National Forest Travel Management Plan, USDA (2001) and Hamann et al. (1999) suggested in both their literature reviews that sensitivity occurs near nest sites and mainly affects eggs or young. Direct activities, such as noise from vehicles, could disturb these species during nesting and foraging and may negatively affect them. These species may be sensitive to prolonged OHV use adjacent to their nest. USDA (2001) and Hamann (1999) also found prolonged disturbance during nesting season may result in nest and young abandonment and increased stress levels. Both findings suggest possible recreational disturbances affect raptors by causing parents to desert young or eggs, exposure of unprotected egg or nestling to weather, avian nest predation, or nestling leaving the nest prematurely; recreation on cliffs may cause accidental pushing of nests off cliffs (Hamann et al. 1999). Also, cross-country motorized travel could lead to disturbance that disrupts pair-bonding and increases adult energy expenditures.

Some studies have found that walking straight to a birds' nest (including raptors) is more disruptive than vehicle or OHV use (Lee 1981; Skagen 1980; Holmes et al. 1993; Burger and Gochfeld 1991; Gill et al. 1996). Specifically, in a northern goshawk and Cooper's hawk study conducted by Lee (1981), female goshawk did not show signs of agitation or flushing from snowmobiles until the riders stopped and got off their machines. In another observation, Lee (1981) found that female hawks did not flush from nests when motorcycles passed by; the author suggested that hawks may become habituated to moving machines, and may tolerate disturbances such as hikers, snowmobiles, motorcycles, and horseback riders so they can keep territories that meet resource needs.

Flecher et al. (1999) conducted a raptor study in Colorado riparian corridors that included some recreation trails. They found red-tailed hawk abundance was similar between the controlled sites to the trail sites. They concluded red-tailed hawks seem to tolerate human activity along the recreational trails. A study of red-tailed hawks in Wasco County, Oregon found that normal human activity did not affect red-tailed hawk reproductive success; additionally, the presence of dwellings or frequently travelled roads and the locations of nests near roads had no significant effects and compensation for normal human activities was not necessary for estimates of reproductive success (Janes 1984). Additionally, raptors have been known to use small two-track roads and trails that experience low use and have existing canopy cover on the sides as foraging

habitat (Flecher at al. 1999, St. Pierre 2008). Some avian scavengers prefer to use these types of open areas because vegetation may hide potential predators while they are feeding (Skagen et al. 1991).

Ospreys nest around lakes with high human activity (including fishing, boating, OHV use, snowmobile use, camping, hiking, biking, and bird viewing) but still can be sensitive to the recreational disturbances, especially in remote areas (Hamann 1999; Poole 1981). During recreation seasons, ospreys have been known to keep territories with low level of human activity (Levenson and Koplin 1984). The more remote the nest location is the higher probability of an osprey is to flush when disturbed; flushing can increase risk during hatching and raising young, causes adult ospreys to expel needed energy, and leaves the egg or nestling at risk of exposure to weather and predation (Reese 1991). User-created routes can decrease habitat by providing increased access to snags and other deadwood for firewood harvest (USDA 2001), which could affect osprey habitat.

Direct and Indirect Effects Common to All Alternatives

Existing and potential disturbance from vehicle use on roads and motorized trails and the associated fragmentation (edge effect) was modeled. The assumption was disturbance would continue within the road effect zone (660 feet or 200 meters each side of roads or motorized trails) for the OHV travel system described in each alternative. Decreased habitat quality, reduced reproductive potential, and avoidance of the road effect zone are potential effects as a result of habitat alteration physically or due to disturbance. The acres within the 660 foot disturbance band (200 m) displayed in Table 115 are based on additional trail placement, but do not reflect improvements from mitigations. Disturbance would decrease beyond the road or motorized trail effect zone for each alternative and as a result, habitat quality and amount would increase in areas more distant from motorized routes. Disturbance would decrease in areas where existing road closures are reinforced, user-created trails are rehabilitated and new road closures are implemented under the action alternatives.

Table 115 illustrates the amount of potentially disturbed nesting habitat for the northern goshawk, osprey and other raptors. The increase in potential disturbed area is directly related to the change in roads and trails open for motorized use in proximity to known nest sites.

Alternative 1 – No Action

The current level of disturbance to raptors, whether they are habituated or not, would be most likely to continue until the Travel Management Rule is fully implemented as no physical reinforcement of existing closures would be done under this alternative. Several studies have suggested that walking straight to a bird nest (including raptors) is more disruptive than vehicle or OHV use (Lee 1981; Skagen 1980; Holmes et al. 1993; Burger and Gochfeld 1991; Gill et al. 1996). The majority of the existing open road network in the project area has been in place for several years or more, and some level of habituation to motorized traffic has probably occurred for nesting red-tailed hawks since 8 nests are documented in the project area in proximity to open roads.

Off-road travel is unlikely to occur early in the nesting season in the majority of the project area due to elevation and snowpack, but is fairly common in much of the project area in the middle of the nesting season and later as snowpack recedes and firewood cutting season opens. Exceptions can occur during vegetation management actions that require snowplowing to access treatment units. Off-road foot travel increases substantially during the big game archery season, which starts after the critical period of raptor nesting season.

Action Alternatives

There are 0.25 miles of designated trail system within 660' of hawk nests on existing open roads in Alternative 2. There are also designated trail segments within ¼ mile of osprey nests as follows: 0.6 miles in Alternative 2; 0.5 miles in Alternative 3; and 0.5 miles in Alternative 4. Within ¼ mile of goshawk nests there are 3.0 miles in Alternative 2; 1.5 miles in Alternative 3 and 2.8 miles in Alternative 4. The lengths of trail system within proximity to raptor nests are displayed in Table 115. Some of these trail system miles within distance bands around raptor nests are on existing open roads.

Table 115. Raptor Nest Buffer Impacts within the Ochoco Summit Analysis Area.

Raptor Species	Buffer Radius	Alternative 1	Alternative 2	Alternative 3	Alternative 4
goshawk	¼ mile	0	3.0 miles	1.5 miles	2.8 miles
osprey	¼ mile	0	0.6 miles	0.5 miles	0.5 miles
Other raptor	660'	0	0.25 miles	0	0

For each of the action alternatives the amount of undisturbed habitat changes due to the opening up of trails on closed roads, construction of new trails, closing of roads and defining which roads and trails would become part of the trail system. Studies have shown that human activity near a nest site, e.g. walking around or stopping vehicles, has more of an effect than OHV use, riding by a nest (Lee 1981; Skagen 1980; Holmes et al 1993; Burger and Gochfeld 1991; Gill et al. 1996). For this reason stationary long duration activities such as construction and maintenance activities would be restricted seasonally where in proximity to active raptor nests as shown in Table 4.

Although new trail construction has potential to remove snags with potential for nesting, a very limited amount would be removed, compared to the snags available on a landscape basis. Only those that are within the tread of the trail, leaning toward the trail, or within striking distance of a staging area or trailhead would be felled. Due to the very limited circumstance and scope of snag felling operations, control of where motorized activity would occur, action alternatives would have a negligible effect to osprey and red-tailed hawk.

Cumulative Effects - Raptors

Once the Travel Management Rule is fully implemented, action alternatives should result in a decrease of disturbed habitat when compared to Alternative 1. This would be the result of the combined effect of existing road closure reinforcement and rehabilitation of user-created trails in combination with implementation of the forest-level Travel Management Plan. Motorized travel would then be limited to designated motorized routes and potential for users to forge new routes into existing known or unknown nest sites off of mixed use roads and designated trails would be reduced.

Recent and ongoing vegetation management projects that overlap the analysis area, (including Spears, Canyon, Howard Elliot Johnson, Zane, Jackson and Deep Restoration) are designed to return many forested stands back to sustainable conditions that can withstand appropriate disturbance processes. These projects would mostly reduce the density of understory trees and apply prescribed fire where appropriate, with the objective of maintaining large trees on the landscape. Implementation of these large scale projects include several years of activity involving multiple timber sales, stewardship projects, force account project work and service contracts. The planned projects would reduce the amount of dense structured forested stands the goshawk, Cooper's hawk and sharp-shinned hawk prefer for nesting. However, ongoing and planned vegetation management projects include mitigation measures such as no harvest nest buffers and seasonal restrictions on disturbing activities, and portions of each planning area would remain unharvested, which could provide suitable nesting stands for these species.

Mitigation measures planned for active and proposed vegetation management projects include protection of active nest sites by application of a seasonal restriction for timber harvest and post-sale activities, as well as potentially disturbing non-commercial treatments. This should reduce potential for additive effects to occur during the nesting season. Because large diameter trees would be maintained in each project, nesting habitat would be provided for osprey, golden eagles and red-tailed hawks. Because prescribed burning tends to reduce soft snag abundance and reduce tree density, less nesting habitat would be available for great gray and other forest dwelling owls in treated areas. On the other hand, species that prefer to forage in open areas such as great-horned owl and red-tailed hawk would benefit from commercial thinning. This project would have very little direct effect on existing or potential nesting habitat due to the small scale of impact to the vegetation and supporting land base compared to what is available at the landscape scale. It is not expected that implementation of the Ochoco Summit OHV project in conjunction with overlapping or adjacent vegetation management actions would lead to a change in populations of raptors across the project area because suitable habitat would be provided at the landscape scale with little change resulting from this project, and as shown in Table 92, the action alternatives result in less than a 5% increase in area within 200m (660 feet), and less than 2% increase in lands less than ½ mile from motorized routes. In addition, proposed closures offer better access management, including some existing routes in proximity to known raptor nests.

Land Birds

In January 2001, President Clinton issued an executive order on migratory birds, directing federal agencies to avoid or minimize negative impacts of their actions on migratory birds, and to take active steps to protect birds and their habitat. A Memorandum of Understanding (MOU) between the U. S. Fish and Wildlife Service and the U. S. Forest Service was signed in 2008 to conserve migratory birds, including habitat restoration and enhancement, prevention of pollution affecting birds, and incorporation of migratory bird conservation into the planning process whenever possible. This planning effort focuses on the Landbird Strategic Plan described below to address conservation of migratory and other landbirds.

Landbird Strategic Plan

The Forest Service has prepared a Landbird Strategic Plan (January 2000) to maintain, restore, and protect habitats necessary to sustain healthy migratory and resident bird populations to achieve biological objectives. The primary purpose of the strategic plan is to provide guidance for the Landbird Conservation Program and to focus efforts in a common direction. On a more local level, individuals from multiple agencies and organizations within the Oregon-Washington Chapter of Partners in Flight participated in developing five publications for conserving landbirds in this region (Oregon and Washington). A Conservation Strategy for Landbirds in the Northern Rocky Mountains of Eastern Oregon and Washington was published in May 2000 (Altman, 2000) is one of five plans that cover all priority habitats for landbirds in Oregon and Washington. This strategy has been used since its development in planning and projects analysis on Ochoco National Forest.

This project area falls within the Northern Rocky Mountains Planning Unit and the Blue Mountains Subprovince. This strategy emphasizes ecosystems and important habitat conditions and features used by landbirds, rather than individual species. However, species were selected in the conservation strategy to represent habitat types or features considered at risk. Each focal species listed in Table 116 provides a focus for describing desired conditions and attributes of priority habitats. Establishment of conditions favorable to focal species will also likely benefit a wider group of species with similar habitat requirements. Consistency with the Altman habitat recommendations are disclosed for those species listed in this section. Table 116 shows the focal species for the habitats that occur within the project area.

Table 116. Priority Habitat Features and Associated Focal Species for Northern Rocky Mountains Planning Unit, Blue Mountains Subprovince.

Habitat	Habitat Feature (Conservation Focus)	Focal Species
Dry Forest (Ponderosa Pine and Ponderosa Pine/ Douglas-fir/ Grand Fir	Large patches of old forest with large trees and snags	White-headed woodpecker
	Old forest with interspersion of openings and dense thickets	Flammulated owl
	Open understory with regenerating pines	Chipping sparrow
	Patches of burned old forest	Lewis's woodpecker
Mesic Mixed Conifer (Late Successional)	Large snags	Vaux's swift
	Overstory canopy closure	Townsend's warbler
	Structurally diverse, multi-layered forest	Varied thrush
	Dense shrub layer in forest openings or understory	MacGillivray's warbler
	Edges and openings created by wildfire	Olive-sided flycatcher
Riparian Woodland	Large snags	Lewis' woodpecker
	Canopy foliage and structure	Red-eyed vireo
	Understory foliage and structure	Veery
Riparian Shrub	Willow/alder shrub patches	Willow flycatcher
Unique Habitats	Subalpine Forest	Hermit thrush
	Montane Meadows (wet/dry)	Upland sandpiper
	Steppe Shrublands	Vesper sparrow
	Aspen	Red-naped sapsucker
	Alpine	Gray –crowned rosy finch

The following species have not been documented to occur and there is no suitable habitat present in the project area: red-eyed vireo, gray-crowned rosy finch. One upland sandpiper was recorded on private land meadows within the project area in 1987. No subsequent records for this species were found for this project area. None of these species is listed in "Common Birds of the Ochoco Region – All birds of the Ochoco Region except ultra rareties and vagrants" (USFS, 2001). Some of the species listed in Table 116 are covered in other sections of this document either as an individual species or group of species. Existing habitat conditions and potential impacts to Lewis's woodpecker, white-headed woodpecker and the upland sandpiper have been discussed in the Threatened, Endangered, and Sensitive wildlife species section of Chapter 3 of this DEIS. Effects to the red-naped sapsucker and flammulated owl have been disclosed in Chapter 3 of this DEIS within the Management Indicator Species and Other Species sections, respectively. Please refer to those sections for detailed discussion for those species. The focal species with potential to be found in the analysis area, which were not discussed in previous sections of this document as discussed below.

The remaining focal species identified from the lists with the potential to be found within the project area are listed in "Common Birds of the Ochoco Region" as follows: Abundance ranking 1 (abundant), chipping sparrow; ranking 2 (common), vesper sparrow and MacGillivray's warbler; ranking 2 to 3 (common to occasional), Townsend's warbler; ranking 2 to 4 (common to uncommon), ranking 3 (occasional) Vaux's swift and hermit thrush; ranking 3 to 4 (occasional to uncommon), varied thrush; ranking 4 to 5 (uncommon to rare), olive-sided flycatcher, willow flycatcher and veery. Many of the abundance rankings vary seasonally since many of these birds migrate annually.

General Effects to Land Birds

Literature is available that discusses vehicle and trail impacts to songbirds, also known as passerine species. Impacts known to affect songbirds are noise and distance from roads and trails. For example, noise can affect avian species by masking mating songs or communication calls (Konish 1970, Marler et al. 1973, Klump et al. 1984, Reynolds et al. 1992, Wollerman 1998 in AMEC 2005, and AMEC 2005). Species cannot hear territory calls, mating calls, or low frequency noise from predators with increased background noise from vehicles (Klump et al. 1984, Reijen and Foppen 1994, Montana TWS 1999, and Erbe et al. 1999 in AMEC 2005). Studies also found that the further away from the road or trail the more abundant the passerine species are (Sauvajot 1998, Miller et al. 1998, Forman 2000 and Barton and Holms 2006).

Romain-Bondi (2009) stated the common wildlife response to increased human activity is avoidance or displacement. The roads and trails may not provide enough protection/cover from predators and may not provide foraging and roosting areas for wildlife. Other variables that may impact wildlife include, but are not limited to noise, dust, speed, soil compaction, and possible harassment of wildlife (Romain-Bondi 2009, Ouren, 2007). The selection of Alternative 1 would result in no change in motorized use in the project area. However, assuming some species displacement or individuals or pairs may occur, a disturbance buffer analysis was conducted as shown in Table 117. It was assumed all open roads are being used and a 200 m (660 feet) zone of disturbance was applied to each side of the motorized routes. This analysis showed 38 percent of the analysis area is within the disturbance zone although it is unknown if this level of disturbance is resulting in reduced nesting success in the project area. With Alternative 1 the existing open and closed roads and user created trails would be expected to continue having motorized use. Refer to the noise impacts discussion in the General Wildlife section of this Chapter. Based on a 200 meter (660 ft) distance band on each side of an open road, approximately 160 acres may be impacted by noise from open roads. However, this buffer may overestimate effects to these species based on the Ingerlfinger and Anderson (2004) study showing reduced species density within 100 meters (330 ft) from a roadside (80 acres per mile). On the other hand, the open road analysis does not include unauthorized use of closed, decommissioned or user created routes. In many cases traffic on these unauthorized routes may occur infrequently enough that the noise would not disrupt reproductive behavior or survival of passerine birds.

Among the open roads, there are multiple high speed paved or gravel roads with traffic volumes of ten or more motorized vehicles per day within the project area during nesting season. Nesting habitat 100 meters (330 feet) from these roads would likely experience similar disturbance levels Ingerlfinger and Anderson (2004) found in their study. While road volume does increase during the hunting seasons beginning in mid-August, the increase occurs after the nesting period for local passerine species.

A 200 meter (660 feet) each side road and trail disturbance zone was modeled to determine the area with potential noise disturbance for the entire analysis area. Due to the fact that the majority of motorized routes under any alternative are on or in proximity to existing open roads, there is only about a 5% difference in the amount of area within this disturbance zone between the action alternatives and a 6 to 11% difference between the action alternatives and the no action alternative. Results from the disturbance zone analysis across the project analysis area are displayed in Table 117. The addition of proposed trails to the existing network of open roads resulted in an increase in disturbance area of 3 to 5% across the analysis area. Under Alternatives 2, 3 and 4, the percentage of the analysis area within 200 m (660 feet) of an open motorized route is 42%, 41% and 43% respectively.

Table 117. Acres within 200 m (660’) of any open road or trail.

Alternative 1	Alternative 2	Alternative 3	Alternative 4
115,127	125,745	123,036	129,390

Alternatives 2, 3 and 4 would designate an official OHV trail system. Selected unauthorized roads and trails not designated as part of the system would be closed for motorized vehicle use. Improvement of existing road closures, and blockage of unauthorized and user created trails could result in improvement to local passerine species habitat by reduction of motorized disturbance along those routes that are closed. This potential improvement is not reflected in Table 117, as the disturbance band analysis was based on open system roads and did not include breached closures, user created routes and other unauthorized travel routes such as horse trails and non-system roads. OHV use is projected to increase 2 to 5 percent per year with the new system and open roads may also experience an increase in volume. The area within 200 m of a designated open road or trail should not increase as this level of use increases, but the intensity of disturbance on the designated network is expected to increase as the level of use increases.

Existing Condition of Individual Focal Species of Land Birds

Chipping sparrow: In Central Oregon, chipping sparrows can be found in open coniferous forests or stands of trees interspersed with grassy openings or low foliage and are found in good numbers in central Oregon in juniper, ponderosa pine, and lodgepole pine forests (Marshall et al. 2003). They are associated with higher elevations are summer residents preferring open habitats with a shrub or regenerating pine component. Chipping sparrows occupy successional habitats after logging or burning because of an affinity for open, older stands of western mixed conifer forest (DeGraaf and Rappole 1995).

The current NatureServe Conservation Status Rank for chipping sparrows in Oregon is a S4, ‘apparently secure,’ and National 5, ‘secure’ and Global 5 ‘secure’ (2009). Breeding bird surveys have shown that population declines of chipping sparrows have averaged 3.9 percent annually in Oregon due to a decrease in fire to maintained open woodlands but also due to cowbird brood parasitism and competition with house sparrows and house finches (Marshall et al. 2003). Chipping sparrows are known to occur on both Lookout Mountain and Paulina Ranger District, including locations within the analysis area for this project. Habitat for the chipping sparrow includes open canopied stands of lodgepole pine, ponderosa pine, Douglas-fir, or grand fir with tree diameters 10-15 inches or larger, especially where patches of regenerating pine seedlings and saplings are present. Such habitat is present in patches across the analysis area.

Vaux’s swift: The Vaux’s swift is associated with large snags in mesic mixed conifer forests. It is an aerial insectivore typically associated with late-successional forest and dependent on very large, hollow snags for nests and roosts. The best variables to predict Vaux’s swift occurrence is the number of snags greater than 20 inches dbh and the number of tress with conks of Indian paint fungus (Bull and Beckwith, 1993). Conservation issues listed in the landbird plan include loss of large snags during intensive forest management and insufficient recruitment of large snags through harvest rotations. Habitat objectives include retention and development of snags greater than 27 inches dbh and 82 feet in height in different stages of decay, including hollow snags. Recommended conservation measures include retention of broken topped trees, especially those over 4’ inches dbh, large snag retention and recruitment of replacement snags (large live trees with defect).

The current NatureServe Conservation Status Rank for Vaux’s swift is Global G5 ‘secure’, National N5B ‘secure, breeding’ and Oregon S5 ‘secure’ (2009). Breeding bird surveys have shown state-wide population increases for Vaux’s swift of 3.7 percent annually in Oregon (1966-1999), while Sharp (1992) estimated a 8.9% decrease on National Forests during the 1980’s. The decline was attributed to harvest of late seral coniferous forests and conversion of stands of late seral grand fir dominated stands to early seral stands dominated by ponderosa pine which do not develop hollow tree structure as readily as grand fir does (Marshall et al. 2003). Vaux’s swifts have been recorded on Paulina Ranger District, but not within the analysis area.

Townsend's warbler: The Townsend's warbler is associated with overstory canopy closure and understory structure in mesic mixed conifer forests. It foraged preferentially in grand fir and to a lesser extent larch and avoids ponderosa pine and Douglas-fir in northeastern Oregon. It has also shown a positive association with larger tracts of closed canopy forests than in stands with more perimeter (edge). Conservation issues listed in the landbird plan include loss of habitat where restoration of historic dry forest conditions return current stands of mixed forest to open pine dominated stands. Habitat objectives include where ecologically appropriate, retain patches of mixed conifer forest at least 100 acres in size, with greater than 50% crown closure and with late successional conditions (mature and old-growth forest) dominate by grand fir or Douglas-fir. Recommended conservation measures include designation of unmanaged or lightly managed areas where overstory canopy closure is emphasized.

The current NatureServe Conservation Status Rank for Townsend's warbler is Global G5, 'secure', National N5B 'secure, breeding' and NNRN 'not ranked, nesting' and Oregon S4 'apparently secure' (2009). The Townsend's warbler has greatly increased in abundance in the Blue Mountains as a result of fire suppression and subsequent increases in understory Douglas-fir and grand fir (Marshall et al. 2003). Townsend's warblers are known to occur on both Lookout Mountain and Paulina Ranger District, including locations within the analysis area for this project.

Varied thrush: The varied thrush is associated with structurally diverse, multi-layered canopy conditions in mesic mixed conifer forests. It is an omnivore that gleans understory debris in dense, older, mesic mixed conifer stands, especially in wet sites with closed canopy above 3000' elevation. Conservation issues listed in the landbird plan include loss of structural complexity, canopy layering and organic matter on the forest floor due to forest management practices. Several studies indicate that this species is area sensitive and avoids edges (McGarigal and McComb, 1995, Manuwal and Pearson, 1997). Habitat objectives include retaining blocks of late successional forest at least 75 acres in size; retention of patches with high canopy closure (greater than 60%), and with multiple tree layers with mixed species composition including at least 25% deciduous vegetative cover for dense leaf litter. Recommended conservation measures include maintaining large tracts of forested stands to reduce the amount of edge and fragmentation; conduct thinning from below to enhance diversity in forest structure, to enhance survival of suppressed and intermediate trees, and to promote growth; conduct thinning in conjunction with underplanting where necessary to increase tree layering and species diversity; and retaining or planting native berry and fruit producing shrubs in the understory.

The current NatureServe Conservation Status Rank for varied thrush is G5 globally 'secure', N5 nationally 'secure' and Oregon S4 'apparently secure' (2009). Breeding and wintering abundance varies cyclically every 2 to 5 years. Though the overall population trend is declining in Oregon, Washington and Northern California, its status east of the Cascades is unknown (Marshall et al. 2003). Varied thrushes are known to occur on both Lookout Mountain and Paulina Ranger District, including locations within the analysis area for this project.

MacGillivray's warbler: The MacGillivray's warbler is an indicator for dense shrub layer in forest openings or understory in mesic mixed conifer forests. This species is more common in open-canopy stands and regenerating forests than in closed canopy stands and are positively associated with wood shrubs up to 15 ft in height. In grand fir forests of the Blue Mountains they are associated with well-developed understories of shrubs, seedlings and saplings. Habitat objectives include where ecologically appropriate manage stands to tree canopy cover and herbaceous ground cover to less than 25% each, and dense understory shrub cover of greater than 40% and 270 stems/acre (including shrubs, seedlings and saplings). Recommended conservation measures include grazing management to achieve habitat objectives described above.

The current NatureServe Conservation Status Rank for MacGillivray's warbler is G5 globally 'secure,' N5B nationally 'secure, breeding' and Oregon S4 'apparently secure' (2009). According to Marshall et al. (2003) loss of riparian habitat and forest management practices that are intended to return stand conditions to open understory may have, or are likely to result in local population declines east of the Cascades. Breeding bird surveys have shown conflicting population trends between states and regions within the Oregon range depending on trends in forest practices that provide or remove shrubland habitat. Grazing, fire and herbicide treatments have also been identified as threats to this species (Marshall et al. 2003). MacGillivray's warblers have been recorded in every county in Oregon, and breeds throughout the Blue Mountains (Marshall et al. 2003). There are few records for this species on Ochoco National Forest, one occurred in the vicinity of Mt. Pisgah, which is within the analysis area for this project.

Olive-sided flycatcher: The Olive-sided flycatcher inhabits montane and northern coniferous forests up to 3,000 meters in elevation, especially in burned-over forest areas with tall standing dead trees (DeGraaf and Rappole 1995). In Oregon this flycatcher is a summer resident that breeds in low densities throughout coniferous forests. The olive-sided flycatcher is an aerial insectivore that prefers forest openings or edge habitats where forest meets meadows, timber harvest units, rivers, bogs or marshes (Marshall et al. 2003). The current NatureServe Conservation Status Rank for the olive-sided flycatcher in Oregon is a S3B, 'breeding vulnerable,' National 4B, 'breeding apparently secure' and Global G4 'apparently secure' (2009). NatureServe (2010) stated that fire suppression throughout the breeding range has limited the acreage of available habitat. It also reports that the species is "apparently secure" globally although at risk from deforestation on wintering grounds in Central and South America.

This flycatcher is considered a contrast species using old forests for nesting and either openings or gaps in old forests for foraging. Large trees and snags are preferred habitat elements for the olive-sided flycatcher (Romain-Bondi 2009). The species is positively associated with recent burns (Hejl 1994 cited by Wisdom et al. 2000).

Veery: The veery is associated with understory foliage and structure in riparian woodlands. In the Blue Mountains hawthorne, dogwood and willow are listed as important. Though black hawthorne is listed as encountered in the Blue and Ochoco Mountains (USFS, 1992), it is an uncommon species and generally limited in distribution on Ochoco National Forest. Dogwood and willow are widely distributed across riparian habitats within the project area.

The current NatureServe Conservation Status Rank for veery is Global G5 'secure', National N5B 'secure, breeding' and Oregon S4?B 'apparently secure, inexact numeric rank, breeding' (2009). According to Marshall et al. (2003) the Ochoco Mountain breeding colonies have remained relatively small and isolated for at least 30 years, and that population trends for breeding birds in Oregon remain relatively unknown. Breeding bird surveys have shown that this species is an uncommon breeder at low to middle elevations in the Blue Mountains, where sufficient riparian thickets exist, and that they are uncommon and local in Crook County (Marshall et al. 2003). Sightings of veery have been recorded on Lookout Mountain Ranger District in the vicinity of Ochoco Ranger Station, which is within the analysis area for this project.

Willow flycatcher: Marshall et al. (2003) describe the willow flycatcher as a relatively late-arriving migrant to Oregon that is associated with shrub-dominated habitats, especially riparian willow thickets. Breeding habitat is characterized by dense shrubs and/or tall herbaceous plants with scattered openings of shorter herbaceous vegetation. Marshall's et al. (2003) book *Birds of Oregon* displays a map showing locations of willow flycatchers by county. In the project area reproductive potential ranges from none to probable, with no confirmed nesting. Three requirements for willow flycatcher habitat are large meadow size, water and willows (Sanders

and Flett 1989). Nest sites tend to be in shrubs or other shrub-level vegetation within a few feet of the ground. Territories tend to be small approximately one acre. Diets have not been studied in Oregon but the species is an aerial insectivore that feeds primarily on the wing and occasionally gleans (Sedgewick 2000 cited in Marshall et al. (2003). Factors indicated as a conservation concern include loss and degradation of the quality of riparian shrub habitats from altered hydrologic regimes, disturbance, and loss of habitat from overgrazing, and cowbird parasitism. Proposed conservation strategies are to increase width of riparian shrub zones through plantings, discourage aggregations of livestock near riparian areas, and eliminate willow cutting and herbicide use in the riparian zone. The current NatureServe Conservation Status Rank for willow flycatcher in Oregon is a S4, 'apparently secure', National NNR, 'unranked nationally' and Global G5T5 'secure' both at the species level and at the Oregon/Nevada subspecies level, (2009).

Nesting habitat consists of riparian areas with the presence of dense willow clumps, or other shrubbery, and uplands. Nesting uplands are low elevation valleys to high mountain areas in early seral stages of high conifer dominated stands (Marshall et al. 2003). The project area contains very limited acreage of dense willow thickets. However, there are a few pockets with well-established willows along meadow edges in or near Big Summit Prairie and Little Summit Prairie. Observations of willow flycatchers have not been reported within the Ochoco Summit OHV project area or elsewhere on Lookout Mountain or Paulina Ranger Districts.

Hermit thrush: The hermit thrush is a summer resident preferring mid to high elevation mature and old growth forests. It breeds in mature forests of all types especially those with a shaded understory of brush and small trees ranging from aspen groves to juniper woodlands to moderately open coniferous forests. Gilligan et al. (1994) described the Hermit thrush as a fairly common summer resident in the Cascade, Siskiyou and Blue Mountains and uncommon in the Coast Range of Oregon. Hermit thrushes nest on the ground, in brush or small trees. It is an opportunistic ground forager, feeding on insects and an occasional reptile or amphibian (Marshall et al. 2003). During the winter months they are rarely seen east of the Cascades and tend to winter in the west-side lowlands and foothills along the coast. There appear to be no serious conservation problems at this time (Marshall et al. 2003). The current NatureServe Conservation Status Rank for hermit thrushes in Oregon is a S4, 'apparently secure', National N5, 'secure' and Global G5 'secure' (2009).

Though hermit thrush was identified as a focal species for subalpine forest as a unique habitat, this species may include all forested PAGs with tree diameters exceeding 10-15 inches with a dense canopy within Ochoco National Forest. Virtually all of the suitable habitat for this species in the analysis area is on National Forest System lands within the grand fir (mixed conifer), Douglas-fir and ponderosa pine PAGs. Within the Ochoco Summit analysis area suitable habitat is present all along the Ochoco Mountains, with nesting habitat located on Coyle Butte, Round Mountain, Lookout Mountain, Slide Mountain, Indian Butte, Mt. Pisgah, East Point, Peterson Point, Buck Point, Bear Mountain and all the moderate to high elevation, north and east facing, forested slopes in between. Very limited surveys have occurred on the analysis area, though there are numerous records from Breeding Bird Surveys on Paulina Ranger District.

Vesper sparrow: The Vesper sparrow is associated with steppe-shrubland habitat. It can be found in a variety of habitat types including grassland, sagebrush, fallow fields, montane meadows, juniper steppe, cropland, open woodlands and openings in forest habitat such as clearcuts. Habitat objectives include where ecologically appropriate initiate actions in steppe-shrublands to maintain or provide a mosaic of steppe and shrubland habitat with less than 10% tree cover. Recommended conservation measures include eliminating or restricting human access and livestock grazing in steppe shrublands that have been degraded.

The current NatureServe Conservation Status Rank for vesper sparrows is a G5T3 Global 'secure,' but with the Oregon subspecies ranking as 'vulnerable,' National N5B, N5N 'secure, breeding and non-breeding' for the species, but NNR 'unranked' for the Oregon subspecies. The federal status US ESA ranking of SC, 'species of concern' applies to the Oregon subspecies. The conservation status ranking in Oregon is S4B 'apparently secure, breeding' for the species, but S2B, S2N for the Oregon subspecies 'imperiled, breeding and non-breeding' (2009). Breeding bird surveys have shown that population trends in Oregon have been relatively stable long-term (1966-1996), but declining in the short-term (1980-1996). Declines are attributed to a variety of factors including agricultural conversion of grasslands and shrub-steppe habitat, changes in agricultural practices and trampling of ground nests. (Marshall et al. 2003). Vesper sparrows have not been recorded on either Lookout Mountain or Paulina Ranger District. However, they are listed as common in spring, summer and fall in "Common Birds or the Ochoco Region."

Effects of the Action Alternatives to Individual Species of Land Birds

This project would have very little direct effect on existing or potential nesting habitat of any of these landbird species due to the small scale of impact to the vegetation and supporting land base compared to what is available at the landscape scale in the vegetation type where each species is most likely to be found. The potential reduction of habitat types under each action alternative was estimated by determining how many miles of new trail (not on an existing road) would be created in each habitat type, and how many acres would need to be cleared for trail creation. Also, acres that would need to be cleared in association with staging areas were estimated (the assumption is up to 5 acres per staging area would need to be cleared). These acre estimates are summarized in Table 118.

Table 118. Estimate of acrest that would need to be cleared by action alternative for the Ochoco Summit OHV Trail System project.

Land Bird	Habitat Type	Alternative 2			Alternative 3			Alternative 4		
		Acres Cleared for New Trail	Acres Cleared for Staging Area	Total Acres of Habitat Reduced	Acres Cleared for New Trail	Acres Cleared for Staging Area	Total Acres of Habitat Reduced	Acres Cleared for New Trail	Acres Cleared for Staging Area	Total Acres of Habitat Reduced
Chipping Sparrow	Ponderosa Pine	16	35	51	8	15	23	19	35	54
Vaux's Swift; Townsend's Warbler	Grand Fir	40	5	45	28	5	33	55	5	60
Varied Thrush; MacGillivray's Warbler	Riparian Hardwood	.4	0	.4	.2	0	.2	.4	0	.4
Olive-sided Flycatcher; Hermit Thrush	All Forested PAGs	68	40	108	46	20	66	90	40	130
Veery; Willow Flycatcher	Alder/ Willow	.22	0	.22	.15	0	.15	.22	0	.22
Vesper Sparrow	Grassland, Meadow, Steppe/ Shrubland	17	0	17	6	0	6	21	0	21

Cumulative Effects

All action alternatives would designate an OHV trail system available for use, while the reasonably forseeable forest-level travel management plan would prohibit cross country travel and/or use of closed roads. Some user created trails not used for the designated system would be closed and rehabilitated. This would result in an increase in the amount of undisturbed nesting habitat in selected areas under all action alternatives. While local landbirds may still be subjected to motorized disturbance during the nesting season (May – July) increased levels of undisturbed

nesting habitat would be available as compared to the existing condition where closed roads and non-motorized trails are currently receiving motorized use, and where cross country travel is occurring. Thus proposed closures and rehabilitation of user created trails, in combination with implementation of the forest-level travel management plan should result in improved amounts of undisturbed nesting habitat in the long run.

This project alone would have very little direct effect on existing or potential nesting habitat of local land birds due to the small scale of impact to the vegetation and supporting land base compared to what is available at the landscape scale in the ponderosa pine PAGs, and in comparison to the much larger vegetation management projects that overlap the analysis area. The Spears, Canyon, HEJ and Deep Vegetation Management projects propose a variety of activities to increase the dominance of open forest conditions in ponderosa pine, and improve riparian hardwood, grassland, meadow and steppe shrubland habitat types; vegetation management associated with these projects would reduce the amount of grand fir in treated units. Species associated with open forest, riparian hardwood and shrub, grassland, meadow and steppe shrubland habitats, including chipping sparrow, varied thrush, MacGillivray's warbler, olive-sided flycatcher, veery, willow flycatcher, and vesper sparrow should benefit from improved habitat conditions in the long run as a result of these vegetation management projects. These vegetation management projects may reduce habitat for Vaux's swift, Townsend's warbler, and hermit thrush, at least in the short-term.

All vegetation management projects in the analysis area include prescribed burning. These actions would reduce the amount of shrub and sapling habitat in the treatment units in the short term. Although Project Design Features in the NEPA documents and burn plan prescriptions usually call for the retention of untreated patches for the nesting birds, small mammal habitat, and big game forage, these actions would reduce the amount of land bird habitat as a result of burning. Short term reduction of understory shrub and pine regeneration is a trade-off for the benefit of long term resiliency of the stands as a whole, as well as for the reduction in fuel loading and subsequent risk of loss to high intensity wildfire. Depending on the prescribed fire return interval some of the shrubs would regenerate and provide nesting habitat until prescribed fire is applied again. While some nesting habitat would be removed, the application of fire would more closely mimic natural disturbance events that occurred in ponderosa pine plant associations. Nesting habitat would still be retained across the landscape (in some stands not selected for vegetative treatments in these NEPA documents) and within treatment units (although potentially in smaller patches depending on burn conditions and the resulting mosaic due to variable fire intensity). Within an analysis area of more than 300,000 acres and with multiple projects affecting potential habitat at a scale of hundreds or thousands of acres, the direct impact of this project on nesting habitat is relatively minute and the cumulative impact on habitat is negligible at the landscape scale.

Botany

Introduction

This section describes expected effects of the Ochoco Summit Trail System project proposed action and alternatives upon botanical resources. Included is 1) the Biological Evaluation for proposed, endangered, threatened, and sensitive plant species, 2) analysis of effects of non-native invasive plants, and 3) effects to special plant habitats.

Threatened, Endangered and Sensitive Plants

Regulatory Framework

Direction for managing habitats for all existing native and desired non-native plants in order to maintain viable populations of species comes from Forest Service Manual 2600 (USFS 1995, WO Amendment 2600-95-7). Sensitive plants receive management emphasis to ensure viability and to preclude trends toward endangerment that would result in the need for federal listing (Forest Service Manual 2672.1). A biological evaluation is conducted to review Forest Service programs and activities for possible effects on endangered, threatened, proposed, or sensitive species, as required in Forest Service Manual 2672.4.

The desired future condition for sensitive species is to ultimately remove them from the U.S. Fish and Wildlife Service's Species of Concern list, and from the Regional Forester's Sensitive Species list. Ensuring that habitat is well distributed with viable, increasing populations within the Ochoco National Forest can contribute to this effort. The LRMP does not specifically identify a desired future condition for sensitive plant species. It does address riparian areas, which provide important habitat for many sensitive species within the Willow Pine Project Area. The LRMP states that most of the riparian areas will be in excellent condition within 50 years, characterized by vigorous stands of forbs, grasses, and grass-like species on stable stream banks.

Analysis Methods

There are no federally listed proposed, threatened or endangered plant species that occur on the Ochoco National Forest. There is no habitat recognized as essential for listed or proposed plant species recovery under the Endangered Species Act; this analysis is therefore limited to species included on the Regional Forester's Sensitive Species List (hereafter referred to as sensitive species) for the Ochoco National Forest. Sensitive species will be grouped by habitat into riparian and scabland species. Design criteria that protect sensitive plants as described in Chapter 2 of the EIS will be taken into account when determining effects. The analysis area for sensitive plants includes the project area boundary as designated by the District Ranger (see maps in Chapter 2). Effects of the proposal will be measured by:

- Acres of sensitive plant populations impacted by proposed trails.
- Number of sensitive plant populations within ¼ mile of proposed trails.
- Acres of sensitive plant habitat impacted by proposed trails.

Information was integrated in part through GIS mapping to portray spatial relationships among sensitive plants and their habitat, and the proposed trail system. Spatial and tabular data for inventoried sites of sensitive plants were taken from the National Resource Inventory System (NRIS) database. To compare the alternatives for effects from motorized travel on trails, GIS was used to calculate the number of acres under each alternative.

Effects of new trail construction and re-construction of revegetated closed roads will be analyzed for short-term effects of 3-5 years. Use is expected to continue on all trails for the long term, >10 years.

Assumptions

- Areas open to motorized recreation have a higher risk of impacting vegetation, including special habitats.
- All forms of motorized vehicles are lumped together in the botany analysis, regardless of class of vehicle.

- Areas that are seasonally closed were analyzed as open because there can be impacts to native plants and native plant habitats regardless of when the area is open. If the area is not 100% closed all year long then it is considered open.
- A primary assumption related to cumulative effects is that the reduction of motorized access off designated routes and modification of motorized access for dispersed camping has a beneficial effect.

Existing Condition

Of the 39 sensitive plant species documented or suspected of occurring on the Ochoco National Forest and the Crooked River National Grassland, 15 have been documented in or near the analysis area, or have potential habitat that has not been surveyed. Species that occur in the project area are listed in Table 119 in bold type. Resources used to identify potential sensitive plant habitat were aerial photographs, vegetation maps, as well as personal knowledge of the analysis area.

The Regional Forester's sensitive species list was updated in 2011; however, the cover letter attached to the new list stated, *"Projects initiated prior to the date of this letter may use the updated list transmitted in this letter or the Regional Forester's Sensitive Species list that was in effect when the project was initiated"* (USFS 2011). The analysis included here is based on the 2008 list. However, the most current species list would be reviewed during project implementation planning; habitat would be evaluated, and surveys conducted according to project design criteria as needed.

Table 119. Summary of the prefield review for sensitive plants in the Ochoco Summit Project Area.

Species	Habitat	Probability of Occurrence	Rationale
Achnatherum hendersonii (Vasey) Bark. Henderson's needlegrass	Sagebrush scablands	High	Habitat Present
Achnatherum wallowaensis Maze & K.A. Robson Wallowa needlegrass	Sagebrush scablands	High	Habitat Present
Astragalus diaphanus var. *diurnus* Douglas ex Hook. S. Fk. John Day milkvetch	Western juniper woodland	Low	Outside documented range
Astragalus peckii Piper Peck's milkvetch	Sage/juniper/lodgepole pumice/coarse soils	Low	Outside documented range
Astragalus tegetarioides M.E. Jones bastard milkvetch	Sage steppe/ponderosa pine forest	Low	Outside documented range
Botrychium ascendens W.H. Wagner ascending moonwort	Wet meadows, springs, seeps	High	Habitat Present
Botrychium crenulatum W.H. Wagner crenulate moonwort	Wet meadows, springs, seeps	High	Habitat Present
Botrychium minganense Vict. Mingan's moonwort	Wet meadows, springs, seeps	High	Habitat Present
Botrychium montanum W.H. Wagner mountain moonwort	Wet meadows, springs, seeps	High	Habitat Present
Botrychium paradoxum W.H. Wagner twin-spike moonwort	Wet meadows, springs, seeps	High	Habitat Present
Calochortus longebarbatus* Wats. var. *peckii Ownbey Peck's mariposa lily	Vernally moist meadows, streambanks	High	Habitat Present
Camissonia pygmaea (Dougl. ex Lehm) Raven dwarf suncup	Low elev plains/washes w/ coarse soil or gravel	Low	No Habitat

Table 119. Summary of the prefield review for sensitive plants in the Ochoco Summit Project Area.

Species	Habitat	Probability of Occurrence	Rationale
Carex abrupta Mack. abrupt-beaked sedge	Montane, mid/high elev moist mdw/open forest	Moderate	Habitat Present
Carex diandra Schrank lesser panicled sedge	Sphagnum bog, lakeshores	Low	No Habitat
Carex lasiocarpa Ehrh. var. *americana* slender sedge	Very wet sedge mdws, along lakes/streams	Moderate	Habitat Present
Carex retrorsa Schwein. retrorse sedge	Swamps, marsh, meadows, along lakes, streams	Moderate	Habitat Present
Cheilanthes feei T. Moore Fee's lip fern	Basalt cliffs but occasionally limestone	Low	Outside documented range
Cyperus lupulinus (Spreng.) Marcks ssp. *lupulinus* Great Plains flatsedge	Riparian edge but dry hackberry, wheatgrass	Low	No Habitat
Elatine brachysperma A. Gray short-seeded waterwort	Muddy shores, shallow pools	Low	No Habitat
Eleocharis bolanderi A. Gray Bolander's spikerush	Seasonally wet; low sage/Sandberg in basalt	Moderate	Habitat Present
Eriogonum cusickii M.E. Jones Cusick's buckwheat	Juniper/big sage and low sage scabland	Moderate	Habitat Present
Heliotropium curassavicum L. salt heliotrope	Moist to dry, saline soils	Low	No Habitat
Lipocarpha aristulata (Coville) G. Tucker aristulate liptocarpa	Low elev, silty below high water along banks	Low	No Habitat
Lomatium ochocense Helliwell & Constance Ochoco lomatium	Sagebrush scablands	Low	Outside documented range
Mimulus evanescens R.J. Meinke disappearing monkeyflower	Sage/juniper vernally moist streambanks	Low	No Habitat
Muhlenbergia minutissima (Steud.) Swallen annual dropseed	Weathered lava soils in riparian	Low	No Habitat
Penstemon peckii Pennell Peck's penstemon	Stream banks Disturbed areas	Low	Outside documented range
Potamogeton diversifolius Raf. waterthread pondweed	Lakes, ponds, including created habitat	Low	Habitat Present
Rorippa columbiae (Suksd. ex B.L. Rob.) Suksd. ex Howell Columbia yellowcress	Wet meadows, moist plains, streams	Low	No Habitat
Rotala ramosior (L.) Koehne lowland toothcup	Sand and silt below high water, Low elevation	Low	No Habitat
Salix wolfii Bebb Wolf's willow	Riparian	Low	No Habitat
Talinum spinescens Torr. (*Phemeranthus spinescens*) spiny fameflower	Sagebrush scablands	Low	No Habitat
Thelypodium eucosmum B.L. Rob. arrow leaf thelypody	Dry slopes in vernal drainages	Low	Outside documented range
Utricularia minor L. lesser bladderwort	Lowland and montane fens, sedge meadows	Low	Outside documented range

Table 119. Summary of the prefield review for sensitive plants in the Ochoco Summit Project Area.

Species	Habitat	Probability of Occurrence	Rationale
Helodium blandowii (F. Weber & D. Mohr) Warnst. Blandow's bogmoss	Montane fens	Low	Specialized Habitat Present
Tomentypnum nitens (Hedw.) Loeske* tomentypnum moss	Montane fens	Low	Specialized Habitat Present
Tortula mucronifolia Schwägr. mucronleaf tortula moss	Riparian *Populus;* montane *Abies*	Moderate	Habitat Present
Dermatocarpon meiophyllizum Vain. silverskin lichen	Rocks inundated at least most of the year	Moderate	Habitat Present
Texosporium sancti-jacobi (Tuck.) Nadv. woven spore lichen	Often old root clumps, scat, or rocks	Low	Outside documented range

Management guidance for sensitive species comes from a variety of sources, including:

- *Calochortus longebarbatus var. peckii* is managed with guidance from a draft Conservation Strategy for the Ochoco National Forest (Dewey 2005).
- *Achnatherum hendersonii* and *A. wallowaensis* are managed with guidance from a draft Conservation Assessment for the Ochoco National Forest (Dewey 2007).
- *Botrychium ascendens, B. crenulatum*, and *B. paradoxum* are managed with guidance from a Conservation Strategy for the Wallowa-Whitman, Umatilla and Ochoco National Forests (Zika 1992).
- Other species are not managed under Conservation Strategies developed specifically for Central Oregon, but guidance is used from Species Fact Sheets and Conservation Strategies from other parts of the State, such as "*Botrychium* on the Mount Hood National Forest" (Zika 1992).

Species that will not be carried through the analysis

Those species in Table 119 that are listed as "Low" do not have potential habitat, are geographically unlikely to occur within the project area, or only occur in specific habitats that would not be affected by the proposed activities. These species will not be carried further in the analysis. The *Astragalus tegetarioides* population in the southeastern part of the project area on Paulina Ranger District is the northernmost population in its range, and is not thought to extend any further; proposed activities are outside the documented range for the species. The same can be said for the *Lomatium ochocense* population on the Lookout Mountain District in the south part of the project area. Extensive surveys have been completed for both species. *Helodium blandowii* and *Tomentypnum nitens* occur in unique high elevation montane fens that are not within areas of proposed trails, and would be protected by design criteria as well.

Field surveys

Surveys for vascular sensitive plants in the project area have been conducted as early as 1980, continuing to the present. Populations of sensitive and rare plants are recorded in the NRIS database; surveys are done by the Limited Focus, and Intuitive Control survey methods. Surveys for sensitive nonvascular plant occurred in riparian areas thought to be high probability habitat from 2004 to 2009. Records containing information on survey routes, surveyor, and results are on file at the Lookout Mountain Ranger District and Paulina Ranger District offices. All routes on existing roadbeds, regardless of whether the road is open, closed, or decommissioned, is

considered previously disturbed and covered with past NEPA analysis. No surveys would be necessary. Any trail proposed in this project that involves new construction will be surveyed for sensitive plants before disturbance takes place and the route is designated for use. This includes user-created trails, snowmobile routes, and other areas not previously surveyed.

The Ochoco Summit Trails project area comprises 266,738 acres within three watersheds. This boundary extends far beyond the actual area affected by the proposed trail system; it takes in the eastern portion of Lookout Mountain Ranger District and the western portion of the Paulina Ranger District. The area has a wide variety of suitable sensitive plant habitat throughout. Elevation ranges from 4,040 feet to 6,926 feet at Lookout Mountain, and corresponding precipitation from 13" to 31" annually (majority receives 21 inches). Human use has affected the project area. Impacts such as deep soil compaction and construction of roads are effectively permanent. Other effects such as erosion, dropping water tables due to stream entrenchment, livestock grazing, and activities such as fire suppression and recreational use are likely to continue, which may limit opportunities for achieving desired conditions. Sensitive plant species that may be affected by the Ochoco Summit Trail System project include those listed in Table 120.

Table 120. Populations of sensitive species that occur, or are likely to occur, within the Ochoco Summit project area.

Species	Known number of populations in the project area	Acres
Species associated with riparian habitat		
Ascending moonwort	1	11.0
Scalloped moonwort	16	26.6
Mingan's moonwort	8	7.7
Mountain moonwort	9	3.2
Peculiar moonwort	1	0.2
Peck's mariposa lily	201	2,744.8
Abrupt-beaked sedge	0	0
Slender sedge	0	0
Retrorse sedge	0	0
Mucronleaf tortula moss	0	0
Silverskin lichen	5	3.0
Species associated with scabland habitat		
Bolander's spikerush	0	0
Cusick's buckwheat	0	0
Henderson's/Wallowa needlegrass	21	126.5
Total	*262*	*2,923.0*

Quantity and diversity of documented sensitive species is high within the project area. Table 2 lists the known total acreage of sensitive species in the project area. Populations often are made up of separate occurrences called subpopulations that may be up to ¼ mile away from each other, usually connected by suitable habitat. Therefore spatially, the populations are spread out on the landscape.

Native vegetation in the project area has been influenced by human activities and associated changes within the last one hundred and fifty years. Most notable changes include eroded stream channels and loss of meadow and riparian habitats due to lowered water tables because of road construction, logging, livestock grazing, loss of beaver, and fire exclusion (USDA 1999). The density of fire intolerant conifers has increased, while the density of understory vegetation (grasses and shrubs) has decreased due to fire exclusion and grazing (Miller and Rose 1999, USDA 1999, Arno 2000, Agee 1993. Conditions in the analysis area generally reflect that described in the Interior Columbia Basin Draft Environmental Impact Statements (USDA/USDI 1997, 2000). As a result of human influences, conditions include a decline in species diversity

and biomass of available forage, increased threats from non-native invasive plants (noxious weeds), and decline in overall landscape health.

General Effects of OHV Use on Vegetation Common to all Alternatives

Direct effects occur from physical damage to vegetation from crushing and breaking of plants as vehicles drive over them (Wilshire et. el. 1978). Plant foliage and stems can be damaged and plants uprooted by vehicles, so that actual plant damage may occur over an area much larger than the track width. Indirect effects of vehicles on vegetation include undercutting of root systems as vehicle paths are enlarged by erosion (Wilshire 1978). Other indirect effects from off-highway vehicle use include the proliferation of exotic plant species and a higher frequency of fire (Lovich and Bainbridge 1999). Effects of these impacts include alteration or destruction of macro- and micro-vegetation elements, establishment of annual plant communities dominated by exotic species, destruction of soil stabilizers, soil compaction, and increased erosion.

The severity of damage to vegetation from vehicles is related to the amount of use that a given area is receiving from OHV use. As the number of vehicle passes increases, an increase in the impact to vegetation is also seen (Adams 1982, Payne et al. 1983, Bolling and Walker 2000). Such impacts have been shown to reduce the cover of native vegetation in OHV areas (Bolling and Walker 2000). When rare plants are present in OHV areas, motorized use can detrimentally impact plant populations by reducing the number and cover of individual plants (Groom et. al. 2005). Table 121 below lists the user-created trail system being used by Central Oregon Motorcycle and ATV Club (COMAC) and the associated sensitive plant locations within travel routes. Currently it is estimated that off road vehicles are affecting approximately 2.52 miles of sensitive plants (those listed as closed or trails in the table).

Table 121. COMAC routes within sensitive plant populations.

Species	Length	Vehicle Type	Maintenance Level
Peck's mariposa lily	6,724 feet	ATV & Shared use	Open road
Peck's mariposa lily	11,571 feet	ATV & Motorcycle	Closed road
Peck's mariposa lily	1,640 feet	ATV & Motorcycle	User-created trail
Silverskin lichen	353 feet	All	Open road
Tomentypnum moss	50 feet	ATV	User-created trail
Blandow's bugmoss	51 feet	ATV	User-created trail

This is a direct effect from tires crushing plant material, but also to soil properties. Even a few passes of a vehicle can compact soil, and repeated use leads to severely compacted and disturbed soils. Such soil compaction can lead to a considerable reduction in vegetation cover, with native plant establishment impaired (Web et al. 1978, Adams 1982, Lovich and Bainbridge 1999, Bolling and Walker 2000). Soil compaction can also increase the potential for non-native, invasive plants to displace native vegetation (Prose et al. 1987, Lovich and Bainbridge, 1999).

The dirt and dust associated with OHV roads and trails can also effect the trailside vegetation (Brooks and Lair 2005). Dust accumulation on plants can impair crucial plant functions such as photosynthesis and transpiration, which can lead to reduced plant growth, recruitment, cover, and survivorship (Walker and Everett 1987).

Direct and Indirect Effects– TES Plants –Alternative 1

Alternative 1 is the No Action Alternative; no trail system would be designated, and no staging or associated camping areas would be developed. Prior to 2011, the current management policy was that most areas within the project area were open to off-road travel by motorized vehicles. This

policy changed with the signed Record of Decision for the Travel Access Management Project, which became effective December 2011. This decision prohibits all motorized access outside of designated roads, trails and areas. Dispersed camping is allowed within 300' of roads. Most vehicle use occurs on roads (personal observation), and the disturbance to native vegetation from the construction of the road is a past action. In the Ochoco Summit project area as a whole there is a low level of off-road use by antler hunters and some amount of willful "mud bogging" in sensitive areas such as meadows and riparian areas (personal observation). The amount of designated open road use is expected to continue as the popularity of OHV use continues to increase and the population of Prineville and the surrounding area continues to increase.

Riparian Habitat Sensitive Species

The No Action Alternative would result in a biological evaluation determination of "No Impact" for all riparian sensitive species.

OHV use in Oregon has increased 2.5 to 5.6% per year in the last decade (Skelton pers. comm.), and it would not be unreasonable to assume that parts of the Ochoco Summit project area has also received some increase in use. New rules regulating OHV use to designated roads would presumably decrease further off-road impacts to sensitive plant species. Some amount of illegal off-road use is expected to continue, especially on the Lookout Mountain Ranger District. The Paulina Ranger District, at present, does not exhibit evidence of sustained damage to vegetation from OHVs (personal observation). It is estimated that currently there is minor impacts to Peck's mariposa lily, sedges, moonworts, and silverskin lichen populations and habitat. Tortula moss is probably not being affected presently due to the specific habitat requirements of rock outcrops and *Populus* species dominated riparian areas.

Of the riparian sensitive species, Peck's mariposa lily has the widest ecological amplitude, occurring on a wide variety of habitat types. The project area contains approximately 46% of the global population of Peck's mariposa lily. Direct impacts to the plants are from crushing of the basal leaf. Repeated damage or loss of the basal leaf each year can reduce the life of an individual by limiting the amount of photosynthate available for bulb renewal (Fiedler 1987). Indirect effects can occur as a result of changes in the microclimate of streams and meadows in the long-term due to streambank disturbance, soil compaction, and vegetation changes. Peck's mariposa lily appears to require a particular moisture regime. The requirements of this condition are not well known due to lack of study, however observations show that altering the hydrology of stream channels is one of the largest threats to the species (Fredricks 1989).

OHV effects to moonwort, sedges, riparian moss and lichen habitat is thought to be less frequent due to the more specific and unique habitats they require. Effects to these species occur from direct crushing of plants and through changes in microclimate. Some moonwort populations are directly adjacent to open roads, such as the crenulate moonwort sites along the 4270-252, 42-430 and 4270 roads, and do have some traffic within the wet spring areas; this vehicle use is expected to continue under Alternative 1. Repeated removal of the sporangia (by crushing from tires, or sediment wash from roadsides) before dispersal could reduce reproductive potential over time (Beatty et al 2003). Habitat modification from changed hydrology patterns is more likely to affect moonwort populations. These species occupy rare, ecologically diverse habitats, and rely on mycorrhizal fungi for water and nutrients. This mycorrhizal relationship is very sensitive to changes in soil moisture, changes in temperature and humidity, or light regime (Potash 1998).

Sensitive species that occur along perennial streams - retrorse, slender and wooley sedges, and silverskin lichen, are vulnerable to direct effects from crushing of plants from OHV traffic or camping activities. Again, effects to habitat are due to changes in stream hydrology and also to soil properties. Even a few passes of a vehicle can compact soil, and repeated use leads to severely compacted and disturbed soils. Such soil compaction can lead to a considerable

reduction in vegetation cover, with native plant establishment impaired (Web et al. 1978, Adams 1982, Lovich and Bainbridge 1999, Bolling and Walker 2000). Soil compaction can also increase the potential for non-native, invasive plants to displace native vegetation (Prose et al. 1987, Lovich and Bainbridge, 1999).

The dirt and dust associated with OHV roads and trails can also effect the trailside vegetation (Brooks and Lair 2005). Dust accumulation on plants can impair crucial plant functions such as photosynthesis and transpiration, which can lead to reduced plant growth, recruitment, cover, and survivorship (Walker and Everett 1987).

The current amount of specific damage to riparian sensitive species populations and habitat by OHV use is unknown, and is expected to decline as new travel rules are enforced. Local OHV clubs (COMAC) have been using an un-authorized trail system that includes 254 miles of trail. The COMAC routes, which include all types of travel routes, from open roads and user created trails, are adjacent and within sensitive plant populations. Of the COMAC trails, 2.52 miles are directly within populations, see Table 3 above.

Scabland Sensitive Species

The No Action Alternative would result in a biological evaluation determination of "No Impact" for all scabland sensitive species.

Henderson's/Wallowa needlegrass is a small bunchgrass that occurs on shallow scablands with little vegetation; the greatest potential for impacts comes from soil disturbance. Roads and trails through these clay soils can cause changes in microclimate surrounding individual ricegrass plants, interrupt moisture flow, and reduce infiltration through compaction. The successional status of Henderson's/Wallowa needlegrass is unknown. It is a deep-rooted perennial bunchgrass confined to a habitat that receives little disturbance. Therefore, it is likely this plant is an indicator of late seral condition. Poor soil productivity does not allow recovery on these sites, and mechanical impacts are long-term, basically permanent (LRMP 1989). Bolander's spikerush occurs in moist areas within habitat similar to the sensitive needlegrasses, as does Cusick's buckwheat, and effects to the plant and habitat would be similar from OHV impacts. There are no known sites of these two species on the Ochoco National Forest. Currently, there are no trails within needlegrass populations, however 40 miles of COMAC trails occur within scabland habitat. Use of these trails is expected to decrease as travel rules are enforced.

Direct and Indirect Effects– TES Plants –Alternative 2

Alternative 2 is the Proposed Action, which would designate a trail system, staging and play areas, and associated camping facilities for all classes of off-highway vehicles. Associated with this action, roads would also be closed and/or decommissioned with appropriate restoration activities to promote recovery of the closed road. Approximately 170 miles of trail would be designated open for travel; this includes 69 miles of new construction, 55 miles of reconstructing previously closed or decommissioned roads, and 46 miles of open road. The trails would include 142 stream crossings, 10 staging areas, and 6 trailheads.

This alternative adds 170 miles of trail to the open roads, trails, and gravel pits that are already designated for OHV use in the project area. In 2007 it was estimated that in Central Oregon as a whole, there were approximately 52,000 visitors using trail systems (Ramming, pers. comm.). The North Millican OHV area had 9,985 riders in 2008, which has similar weather and predicted period of use as the Ochoco Summit proposed trail system (Skelton 2010). In the long-term it is expected that the use would increase by 2.5-5.6 percent per year (Skelton 2010). Estimating on the low end of increase in the first half of the decade due to the current recession, and the high end on the second half of the decade, it is estimated there may be 15,000 riders using the Ochoco

Summit trail system by 2020. This may likely be underestimated based on the 52,000 riders using Central Oregon trails.

Riparian Habitat Species

Alternative 2 would result in a biological evaluation determination of "May Impact Individuals or Habitat But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species" for all riparian sensitive species.

This alternative proposes 31 crossings of perennial streams, totaling 13.8 miles within the RHCA, which is high-probability habitat for the sedges, tortula moss, silverskin lichen, and moonworts. Perennial streams are also moderate to high probability habitat for Peck's mariposa lily. Table 122 lists the sensitive plant populations that would be affected based on the current trail location proposal, which includes 1,645 feet of trail directly within Peck's mariposa lily populations. Project design criteria would prohibit designating trails within these populations (see Chapter 2 of the EIS); however moving the trail out of the known distribution of this particular plant may still be a risk, as the plant does not flower consistently and exact population perimeter is difficult to determine.

Stream crossings would be designed to reduce impacts to water quality (see project design features in Chapter 2 of the EIS) by development such as bridges, elevated puncheons, or culverts. This would help reduce impacts to sensitive plant habitat from repeated traffic. Some potential exists for sediment mobility when hydraulic capacity is exceeded, or when a culvert becomes plugged and the road fills are overtopped. When road fills are breached, sediment loadings can greatly increase (see sections titled "Hydrology" and "Aquatic Species" in Chapter 3 of this document).

Table 122. Length of trail proposed within sensitive plant populations.

Species	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Comments
Peck's mariposa lily	0 feet	200 feet	0 feet	200 feet	Crosses in two places
Peck's mariposa lily	0 feet	160 feet	0 feet	160 feet	Alternatives 2 & 4 include staging area
Peck's mariposa lily	0 feet	750 feet	750 feet	750 feet	
Peck's mariposa lily	0 feet	350 feet	350 feet	350 feet	
Peck's mariposa lily	0 feet	0 feet	0 feet	630 feet	Crosses in two places
Peck's mariposa lily	0 feet	185 feet	185 feet	185 feet	
Total	0 feet	1,645 feet	1,285 feet	2,275 feet	

Approximately 9.9 miles of proposed trail within perennial stream habitat either is a new route, or on a closed or decommissioned roadbed (see Table 123). This equates to 12 acres (at an average 10-foot disturbance width). In addition to trails within perennial streams, there are 76 proposed crossings within class 4 intermittent streams, which is Peck's mariposa lily habitat. The amount of trail within the class 4 RHCA is 2.3 miles, or approximately 2.8 acres of disturbance. These acreages are small when put in context of the overall amount of land in the project area due to the linear nature of trails. This is especially true considering the vast amount of the planning area where no trails are proposed - the southern half of the project area. Indirect effects from dust and carbon emissions to vegetation will be long-term, for however long the trail system is in existence. Dust raised by OHV traffic can disrupt photosynthetic processes, thereby suppressing plant growth and vigor, especially along OHV routes. In turn, reduced vegetation cover may permit invasive and/or non-native plants—particularly shallow-rooted annual grasses and early

successional species capable of rapid establishment and growth—to spread and dominate the plant community, thus diminishing overall endemic biodiversity (USGS 2007).

Effects due to erosion and physical crushing of vegetation directly adjacent to the stream, is not expected because of project design criteria mitigations, which include hardened crossings, bridges and culverts.

There are 10 staging areas, 7 trailheads, and 2 play areas planned within ¼ mile of riparian sensitive plant habitat. These are areas where vehicles, both off-road and passenger vehicles, will congregate. There is a staging area planned directly within a Peck's mariposa lily population along a tributary of Buck Hollow Creek. The greatest effect to sensitive plants in Alternative 2 would come from this staging area, which would likely destroy 0.75 acres of Peck's lily and habitat. The effect may be greater if disturbance increases beyond the currently designated area for staging.

The closest distance for the other staging and play areas is about 215 feet away from the stream. There may be impacts to this riparian area habitat from unauthorized riding from these points, where use can radiate out in many directions. Matchett and others (2004) point out that OHV use may be heaviest on slopes, along right-of-ways, in washes, and in the vicinity of camping facilities. Figure 2 was taken from a study by Webb (1982) on effects to desert soil by motorcycles, showing an area open to OHV use. The area was heavily impacted by trail convergence, passenger vehicles and camping. The study found that after 10 passes of a motorcycle on desert soil, crust and annual plants were destroyed. The terrain in the Ochoco Summit project area is more confined than in this example due to a mostly forested, mountainous setting; however, it is reasonable to conclude that OHV use would be heavier and more difficult to regulate around staging and camping areas.

Table 123. Proposed trails within riparian sensitive species habitat, perennial streams.

Trail Type	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Closed	0 miles 0 acres	5.57 miles 6.7 acres	1.1 miles 1.3 acres	5.9 miles 7.1 acres
Decommissioned	0 miles 0 acres	0.71 miles 0.9 acres	0.53 miles 0.64acres	0.93 miles 1.1 acres
New	0 miles 0 acres	3.62 miles 4.4 acres	2.9 miles 3.5 acres	3.9 miles 4.7 acres

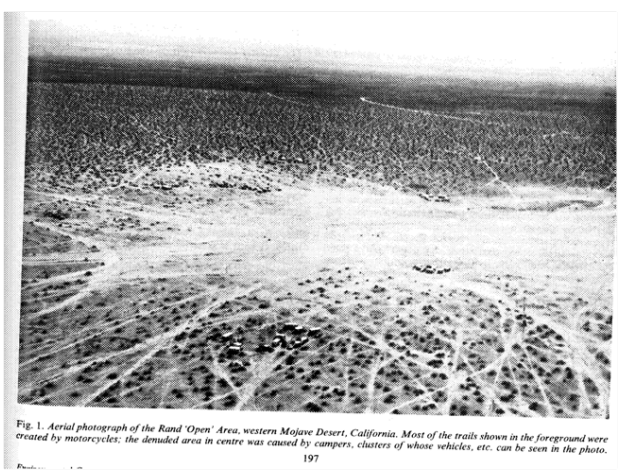


Figure 2. Trail Density and Denuded Camping Area in the Mojave Desert.

Scabland Habitat Species

Alternative 2 would result in a biological evaluation determination of "May Impact Individuals or Habitat But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species" for all scabland sensitive species.

There are no trails proposed within needlegrass, Cusick's buckwheat, or Bolander's spikerush populations. These species all occupy roughly the same habitat types, primarily low and rigid sage, Sandberg's bluegrass on shallow soils. There are 72.3 miles of trail proposed in Alternative 2 within this type of habitat (see Table 124). Using an approximate distance of 10 feet for trail disturbance, this equals about 88 acres of the 64,609 acres of scabland sensitive species habitat in the planning area (less than 1%). Affected Bolander's spikerush habitat would be less than 88 acres because it occupies moist meadows within the scabland habitat. Habitat mapping at that level of detail has not been done, so the exact figure is unknown.

Scablands are recognized as among the most fragile ecosystems on the Ochoco National Forest (USDA 1989). Damage to soil and vegetation is nearly impossible to mitigate due to shallow, unproductive soils. These soils also become heavily saturated and are susceptible to rutting (see Chapter 3 Soil Resource). Impacts of constructed trails and roads are very long-term, if not permanent. Although the effect to this habitat is less than 1%, trails are not easily restored or repaired if used when wet. A project design feature was developed to protect TES plant habitat, by closing the trail system when adverse conditions exist that may result in resource damage (rutting, runoff, etc), however in scabland habitat, once the damage is done, it is permanent.

There are 4 staging areas, 1 trailhead, and 2 play areas planned within scabland sensitive plant habitat. These are areas where vehicles, both off-road and passenger vehicles, will congregate. There are impacts expected to this habitat both from the development of the recreation areas (the exact area is unknown because they are not designed yet, but are estimated at 18 acres), and from unauthorized riding from these points, where use can radiate out in many directions (see Figure 2 and discussion above). These gathering area sites were chosen because most of them have already been disturbed. There is a risk of spreading invasive plants to connected sensitive scabland species habitat that is not disturbed (see Invasive Plant discussion).

Table 124. Trails proposed within scabland sensitive species habitat.

Alternative	New construction	Closed/Decommissioned	Open roads
Alternative 2	30.6 miles	20.1 miles	21.6 miles
Alternative 3	19.2 miles	16.2 miles	7.9 miles
Alternative 4	38.6 miles	22.0 miles	22.7 miles

Direct and Indirect Effects– TES Plants –Alternative 3

Alternative 3 would designate a trail system, staging and play areas, and associated camping facilities for motorcycles and ATVs. The motorcycle loop would be concentrated on the west side of the project area (Paulina Ranger District), while the ATV area would be on the east side of the project area near Highway 26. No OHV trails for jeeps and small trucks (80 inch category) would be included in this alternative. Associated with this action, roads would also be closed and/or decommissioned with appropriate restoration activities that would promote the recovery of the closed road. Approximately 101 miles of trail would be designated open for travel; this includes 50 miles of new construction, 37 miles of reconstructing previously closed or decommissioned roads, and 14 miles of open roads. The trails would include 62 stream crossings, and 4 staging areas.

This alternative adds 101 miles of trail designation (approximately 83 acres) in addition to current designated open roads and dispersed camping areas.

Riparian Habitat Species

Alternative 3 would result in a biological evaluation determination of "May Impact Individuals or Habitat But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species" for all riparian sensitive species.

This alternative proposes 21 perennial stream crossings, for a total of 6 miles in the RHCA, which is high-probability habitat for the sedges, tortula moss, silverskin lichen, and moonworts. Perennial streams are also moderate to high probability habitat for Peck's mariposa lily. Table 123 lists the sensitive plant populations that would be affected based on the current trail location proposal, which includes 1,285 feet of trail directly within Peck's mariposa lily populations. A project design criteria would prohibit designating trails within these populations (see Chapter 2 of the EIS), however moving the trail out of the known distribution of this particular plant may still be a risk, as the plant does not flower consistently and exact population perimeter is difficult to determine.

Stream crossings would be designed to reduce impacts to water quality (see project design features in Chapter 2 of the EIS) by development such as bridges, elevated puncheons, or culverts. This would help reduce impacts to sensitive plant habitat.

There are also trails planned within riparian sensitive species habitat. Approximately 4.5 miles of proposed trail within perennial stream habitat either is a new route, or on a closed or decommissioned roadbed (see Table 123). This equates to 5.4 acres (at an average10-foot disturbance width). In addition to trails within perennial streams, there are 34 proposed crossings (1.2 miles equating to 1.4 acres) proposed within class 4 intermittent streams, which is Peck's mariposa lily habitat. These acreages are small when put in context of the overall amount of area in the project area due to the linear nature of trails. This is especially true considering the vast amount of the planning area where no trails are proposed - the southern half of the project area. Indirect effects from dust and carbon emissions to vegetation will be long-term, for however long the trail system is in existence. Effects due to erosion and physical crushing of vegetation are not expected because of project design criteria mitigations, which include hardened crossings, bridges and culverts.

Alternative 3 does not include the staging area near Buck Hollow Creek that lies within a Peck's mariposa lily population, eliminating the direct effect to this population. There are four staging areas planned within ¼ mile of riparian sensitive plant habitat. These are areas where vehicles, both off-road and passenger vehicles, will congregate. The closest distance is about 230 feet away from the stream. There may be impacts to this riparian area habitat from unauthorized riding from these staging areas.

Scabland Habitat Species

Alternative 3 would result in a biological evaluation determination of "May Impact Individuals or Habitat But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species" for all scabland sensitive species. However, this Alternative would have the least effect to scabland sensitive species of the action alternatives.

There are no trails proposed within needlegrass, Cusick's buckwheat, or Bolander's spikerush populations. These species all occupy roughly the same habitat types, primarily low and rigid sage, Sandberg's bluegrass on shallow soils. There are 43.3 miles of trail proposed in Alternative 3 within this habitat type (see Table 123). Using an approximate distance of 10 feet for trail disturbance this equals about 53 acres of the 64,609 acres of scabland sensitive species habitat in the planning area (less than 1%). Affected Bolander's spikerush habitat would be less than 53 acres because it occupies moist meadows within the scabland habitat. Habitat mapping at that level of detail has not been done, so the exact figure is unknown.

There are no staging areas, trailheads, or play areas planned within scabland sensitive plant habitat in Alternative 3. This, along with the least amount of proposed trails in scablands, results in the least impact of the action alternatives.

Direct and Indirect Effects– TES Plants –Alternative 4

This alternative proposes 212 miles for approximately 173 acres, and 170 stream crossings. New construction of trails would comprise 81 miles (38.4 acres). There are also 10 staging areas, 3 play areas, and 7 trailheads planned. There are 22 miles of OHV trails in Riparian Habitat Conservation Areas. Road closures and associated restoration activities would also take place.

Riparian Habitat Species

Alternative 4 would result in a biological evaluation determination of "May Impact Individuals or Habitat But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species" for all riparian sensitive species.

This alternative proposes 38 crossings of perennial streams, totaling 17.6 miles in the RHCA, which is high-probability habitat for the sedges, tortula moss, silverskin lichen, and moonworts. Perennial streams are also moderate to high probability habitat for Peck's mariposa lily. Table 123 lists the sensitive plant populations that would be affected based on the current trail location proposal, which includes 2,275 feet of trail directly within Peck's mariposa lily populations. A project design criteria would prohibit designating trails within these populations (see Chapter 2 of the EIS), however moving the trail out of the known distribution of this particular plant may still be a risk, as the plant does not flower consistently and exact population perimeter is difficult to determine.

Stream crossings would be designed to reduce impacts to water quality (see project design features in Chapter 2 of the EIS) by development such as bridges, elevated puncheons, or culverts. This would help reduce impacts to sensitive plant habitat from repeated traffic. Some potential exists for sediment mobility when hydraulic capacity is exceeded, or when a culvert becomes plugged and the road fills are overtopped. When road fills are breached, sediment loadings can greatly increase (see sections titled "Hydrology" and "Aquatic Species" in Chapter 3 of this document).

Approximately 10.7 miles of proposed trail within perennial stream habitat either is a new route, or on a closed or decommissioned roadbed (Table 123). This equates to 12.9 acres (at an average10-foot disturbance width). In addition to trails within perennial streams, there are 2.75 miles, 3.3 acres (92 stream crossings) proposed within class 4 intermittent streams, which is Peck's mariposa lily habitat. These acreages are small when put in context of the overall amount of area in the project area due to the linear nature of trails. This is especially true considering the vast amount of the planning area where no trails are proposed - the southern half of the project area. Indirect effects from dust and carbon emissions to vegetation will be long-term, for however long the trail system is in existence. Dust raised by OHV traffic can disrupt photosynthetic processes, thereby suppressing plant growth and vigor, especially along OHV routes. In turn, reduced vegetation cover may permit invasive and/or non-native plants—particularly shallow-rooted annual grasses and early successional species capable of rapid establishment and growth—to spread and dominate the plant community, thus diminishing overall endemic biodiversity (USGS 2007).

Effects due to erosion and physical crushing of vegetation directly adjacent to the stream, is not expected because of project design criteria mitigations, which include hardened crossings, bridges and culverts.

There are 7 staging areas, 1 trailhead, and 1 play area planned within ¼ mile of riparian sensitive plant habitat. These are areas where vehicles, both off-road and passenger vehicles, will congregate. Like Alternative 2, there is a staging area planned directly within a Peck's mariposa lily population near Buck Hollow Creek. The greatest effect to sensitive plants in Alternative 4 would come from this staging area, which would likely destroy 0.75 acres of Peck's lily and habitat. The effect may be greater if disturbance increases beyond the currently designated area for staging.

The closest distance for the other staging and play areas is about 215 feet away from the stream. There may be impacts to this riparian area habitat from unauthorized riding from these staging and play areas from use radiating out in many directions (Matchett et al 2004).

Scabland Habitat Species

Alternative 4 would result in a biological evaluation determination of "May Impact Individuals or Habitat But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species" for all scabland sensitive species.

There are no trails proposed within needlegrass, Cusick's buckwheat, or Bolander's spikerush populations. These species all occupy roughly the same habitat types, primarily low and rigid sage, Sandberg's bluegrass on shallow soils. There are 83.3 miles of trail proposed in Alternative 4 within this type of habitat (see Table 123). Using an approximate distance of 10 feet for trail disturbance, this equals about 101 acres of the 64,609 acres of scabland sensitive species habitat in the planning area (less than 1%). Alternative 4 also proposes the most miles, 38.6, of new trail construction through scabland sensitive species habitat, impacting the most habitat of all the Alternatives. Affected Bolander's spikerush habitat would be less than 101 acres because it occupies moist meadows within the scabland habitat. Habitat mapping at that level of detail has not been done, so the exact figure is unknown.

Scablands are recognized as among the most fragile ecosystems on the Ochoco National Forest (USDA 1989). Damage to soil and vegetation is nearly impossible to mitigate due to shallow, unproductive soils. These soils also become heavily saturated and are susceptible to rutting (see Chapter 3 Soil Resource). Impacts of constructed trails and roads are very long-term, if not permanent. Although the effect to this habitat is less than 1%, trails are not easily restored or repaired if used when wet. A project design feature was developed to protect TES plant habitat, by closing the trail system when adverse conditions exist that may result in resource damage (rutting, runoff, etc), however in scabland habitat, once the damage is done, it is permanent.

There are 4 staging areas, and 1 play area planned within scabland sensitive plant habitat. This is fewer than Alternative 2. These are areas where vehicles, both off-road and passenger vehicles, will congregate. There are impacts expected to this habitat both from the development of the recreation areas (the exact area is unknown because they are not designed yet, but are estimated at 14 acres), and from unauthorized riding from these points, where use can radiate out in many directions (see discussion under Alternative 2).

Cumulative Effects – TES Plants

Within the last decade, past management in the project area has focused on thinning small diameter trees, and using prescribed fire to reduce fuel loadings, which has little cumulative effect to the proposed trail system. Harvest generally avoids riparian areas where sensitive plants and habitat occur. Harvest also does not occur on scablands. New roads associated with harvest have mostly been limited to temporary roads outside of scabs and riparian areas, and are closed after use. Some areas within the project area, such as Deep Watershed, have had extensive restoration activities in both the uplands and riparian areas. The upland scabland-juniper interface has had juniper encroachment removal, which is a benefit to scabland sensitive species. Riparian areas

have also had restoration activities such as headcut repair, fencing, planting, and culvert replacement. While there are short-term effects to riparian sensitive species habitat, cumulatively these actions will be a benefit in the future.

The ground disturbing activities listed in the paragraph above have undoubtedly contributed to and will continue to contribute to the introduction and spread of invasive plant species. The present patterns of recreational use with dispersed campsites and OHV use contribute to the continued spread of invasive plant infestations. The spread of invasive plant species is second only to habitat destruction for endangering imperiled species (Flather et. al. 1994). Implementation of the proposed OHV project would increase the risk of introducing invasive plant infestations in off road areas.

A December 2011 Forest-wide Travel Management Plan decision, closes the Ochoco National Forest to cross country travel except on designated routes or in designated areas. Following implementation of the forest-level Travel Management Plan acres of disturbed habitat would be limited to only those roads and motorized trails that are designated as open to the public for motorized use. COMAC routes that do not overlap with the Ochoco Summit OHV Trails would also be closed. Additional road closures proposed in the action alternatives (see Chapter 2 of the EIS) would combine with the Travel Management Plan so that disturbance would be reduced overall. Prohibiting overland use of OHVs would also reduce the risk of introducing invasive plant infestations in off road areas not associated with designated trails.

Sensitive Species Determination

The Ochoco Summit OHV Environmental Impact Statement addresses the need to provide recreation opportunities for off-road motorized vehicle use. The proposed activities would have negative effects on sensitive plants with suitable habitat within the project area. Table 125 contains the expected effects to sensitive plants for each of the alternatives. These determinations are based on the assumption that all design elements and proper coordination at implementation is in effect. The environmental effects section of the document provides the rationale for each determination.

Table 125. Alternative effects summary to sensitive plant populations and habitat for the Ochoco Summit OHV Trail System Project Area.

Species	Alt 1	Alt 2	Alt 3	Alt 4
Achnatherum hendersonii	NI	MIIH	MIIH	MIIH
Achnatherum wallowaensis	NI	MIIH	MIIH	MIIH
Astragalus diaphanus var. *diurnus*	NI	NI	NI	NI
Astragalus peckii	NI	NI	NI	NI
Astragalus tegetarioides	NI	NI	NI	NI
Botrychium ascendens	NI	MIIH	MIIH	MIIH
Botrychium crenulatum	NI	MIIH	MIIH	MIIH
Botrychium minganense	NI	MIIH	MIIH	MIIH
Botrychium montanum	NI	MIIH	MIIH	MIIH
Botrychium paradoxum	NI	MIIH	MIIH	MIIH
Calochortus longebarbatus var. *peckii*	NI	MIIH	MIIH	MIIH
Camissonia pygmaea	NI	NI	NI	NI
Carex abrupta	NI	MIIH	MIIH	MIIH
Carex diandra	NI	NI	NI	NI
Carex lasiocarpa var. *americana*	NI	MIIH	MIIH	MIIH
Carex retrorsa	NI	MIIH	MIIH	MIIH
Cheilanthes feei	NI	NI	NI	NI
Cyperus lupulinus ssp. lupulinus	NI	NI	NI	NI
Elatine brachysperma	NI	NI	NI	NI
Eleocharis bolanderi	NI	MIIH	MIIH	MIIH

Eriogonum cusickii	NI	MIIH	MIIH	MIIH
Heliotropium curassavicum	NI	NI	NI	NI
Lipocarpha aristulata	NI	NI	NI	NI
Lomatium ochocense	NI	NI	NI	NI
Mimulus evanescens	NI	NI	NI	NI
Muhlenbergia minutissima	NI	NI	NI	NI
Penstemon peckii	NI	NI	NI	NI
Potamogeton diversifolius	NI	NI	NI	NI
Rorippa columbiae	NI	NI	NI	NI
Rotala ramosior	NI	NI	NI	NI
Salix wolfii	NI	NI	NI	NI
Talinum spinescens (Phemeranthus spinescens)	NI	NI	NI	NI
Thelypodium eucosmum	NI	NI	NI	NI
Utricularia minor	NI	NI	NI	NI
Helodium blandowii	NI	NI	NI	NI
Tomentypnum nitens	NI	NI	NI	NI
Tortula mucronifolia	NI	MIIH	MIIH	MIIH
Dermatocarpon meiophyllizum	NI	MIIH	MIIH	MIIH
Texosporium santi-jacobi	NI	NI	NI	NI

NI - No Impact.
MIIH - 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.
WIFV* - Will Impact Individuals or Habitat With A Consequence That The Action May Contribute To A Trend Towards Federal Listing Or Cause A Loss Of Viability To The Population or Species.
BI - Beneficial Impact
N/A - No Habitat or Species Present
***Trigger For A Significant Action As Defined in NEPA**
****Note: Rationale For Conclusion of Effect Is Contained In The NEPA Document.**
Form 2 (R-1/4/6-2670-95)

Non-native Invasive Plants

Introduction

The term invasive plant broadly encompasses all invasive aggressive or harmful non-indigenous plant species, including those designated as noxious weeds. Noxious weeds are those species of foreign origin, which have been listed by the Secretary of Agriculture or responsible state official, which can directly injure crops, or other interests of agriculture, fish and wildlife resources, or the public health. Some noxious weeds are toxic to wildlife, while others are simply unpalatable. The terms invasive plant, noxious weed, and weed are used interchangeably in the text.

Regulatory Framework

Invasive plants are non-native, introduced plants that have the ability to spread into natural habitats where they alter plant communities by displacing native species. Noxious weed is a legal term designated by state and county weed control laws. Noxious weeds are introduced to the United States; there are no native biological agents to keep them in check, and in sufficient numbers they can reduce biological diversity, increase fire risk, poison livestock, and reduce the quality of wildlife forage. The term invasive plant, as used in this document includes all non-native, aggressive species, including noxious weeds. Management of invasive plants is regulated by:

- The Federal Noxious Weed Act of 1974, as amended (7 U.S.C 2801 et seq.) requires cooperation with state, local, and other federal agencies in the application and enforcement of all laws and regulations relating to management and control of noxious weeds.

- U.S. Forest Service Manual 2080 directs the Forest Service to use an integrated weed management approach to control and contain the spread of noxious weeds on National Forest System (NFS) lands and from NFS lands to adjacent lands.
- Executive Order 13112 (1999) directs federal agencies to reduce the spread of invasive plants. Invasive species have been identified by the current Chief of the Forest Service as one of the four threats to ecosystem health.
- In October 2004, the Chief of the Forest Service released a National Strategy and Implementation Plan for Invasive Plant Species Management – part of the President's Healthy Forest Initiative. It focuses on four key elements: preventing invasive species before they arrive; finding new infestations before they spread and become established; containing and reducing existing infestations; and rehabilitating and restoring native habitats and ecosystems.
- Invasive plant management direction contained in Land and Resource Management Plans of the Ochoco National Forest has been amended by the recently published *Pacific Northwest Region Invasive Plant Program – Preventing and Managing Invasive Plants* Record of Decision (USFS 2005). This site-specific FEIS follows new Standards and Guidelines as outlined in the regional document. The regional Record of Decision also releases the USDA Forest Service from direction provided by the 1988 Environmental Impact Statement and 1988 Record of Decision for Competing and Unwanted Vegetation, and the associated 1989 Mediated Agreement for invasive plant management. The R6 2005 ROD added goals, objectives, and standards for invasive plant management by amending the Ochoco National Forests' LRMP.
- Treatment of noxious weeds is regulated by the 1995/1998 Ochoco National Forest Integrated Noxious Weed Management EA, and various categorical exclusions for manual treatment.
- Local prevention measures are outlined in the "Deschutes and Ochoco National Forests and Crooked River National Grassland Invasive Plant Prevention Practices" dated January 2006.

Analysis Methods

The existence, introduction, and spread of weeds are difficult to quantify and attribute specifically to any one vector on a landscape. As a result, this effects analysis will provide a mostly qualitative assessment of the alternatives on the risk potential for weed spread as a function of off-road vehicles, and adjacency of known invasive plant populations. Off-road vehicles are a physical vector of weed introduction and spread, and cause disturbance that creates a weed-susceptible environment.

Invasive plant population, as used here, describes a weed occurrence that can be as small as one plant, to as large as thousands of plants but are spatially separated from other occurrences. Most noxious weed infestations begin on disturbed areas, such as road shoulders, harvest landings, and recreation sites. The level of potential risk of invasive plants among the four alternatives is measured by:

- total mileage of motorized routes designated for this project
- route adjacency to areas infested with weeds

Assumptions used in the analysis:

- Project Design Criteria (PDCs) for invasive plants listed in Chapter 2 of the EIS would be implemented and enforced.
- Vehicles are a vector for the establishment and spread of invasive plants. The more miles that are open to motorized use, the greater the potential for invasive plant spread.
- All highways and open Forest Service roads would continue to receive motorized use by all types of vehicles, which is the same for all alternatives. The differences between alternatives are based on the number of trail miles proposed.
- All forms of motorized vehicles are lumped together in the botany analysis, regardless of class of vehicle. Trails are considered to be 10-feet wide, regardless of class of vehicle, to account for effects from microclimate changes, dust, vehicles passing, etc.
- As determined by the Travel Access Management decision, cross-country travel would not be permitted within the project area.
- A 2.5 to 5.6 percent yearly increase in the number of riders would occur for each of the action alternatives.

Existing Condition

Currently there are 524 noxious weed populations encompassing 2,090 acres within the project area. See Table 126 for a list of weeds present. These weed sites range from a handful of plants, acres of scattered individuals, to areas with complete noxious weed cover. Systematic weed inventories have been completed in some areas through project botanical surveys; other informal inventories occur as Crook County Weed Control and Forest Service personnel travel throughout the project area.

Table 126. Noxious Weed Occurrence within the Ochoco Summit Analysis Area.

Species	Common Name	Morphology	Number of Populations	Acres
Acroptilon repens	Russian knapweed	Perennial with adventitious shoots	3	0.9
Cardaria draba	Whitetop	Rhizomatous perennial	18	5.8
Carduus nutans	Musk thistle	Biennial / winter annual	1	0.1
Centaurea biebersteinii	Spotted knapweed	Short-lived perennial	73	149.8
Centaurea diffusa	Diffuse knapweed	Herbaceous annual to perennial	26	41.3
Centaurea solstitialis	Yellow starthistle	Herbaceous annual	3	18.4
Cirsium arvense	Canada thistle	Perennial with adventitious root buds	83	21.3
Convulvulis arvensis	Field bindweed	Herbaceous perennial	5	0.8
Cynoglossum officinale	Houndstongue	Herbaceous biennial or short-lived perennial	204	1,787.7
Cytisus scoparius	Scotch broom	Woody perennial shrub	1	0.1
Dipsacus fullonum	Teasel	Herbaceous biennial	10	3.0
Euphorbia esula	Leafy spurge	Herbaceous perennial	1	0.25
Hypericum perforatum	St. John’s-wort	Rhizomatous perennial	10	4.6
Leucanthimum vulgare	Oxeye daisy	Rhizomatous perennial	3	0.2
Linaria dalmatica	Dalmatian	Perennial with adventitious root	4	0.78

	toadflax	buds		
Linaria vulgaris	Yellow toadflax	Perennial with adventitious root buds	3	0.6
Onopordum acanthium	Scotch thistle	Herbaceous biennial	8	3.7
Potentilla recta	Sulfur cinquefoil	Herbaceous perennial	10	3.8
Salvia aethiopis	Mediterranean sage	Herbaceous biennial	11	5.9
Taeniatherum caput-medusae	Medusahead	Annual grass	47	40.7
Total			**524**	**2,089.8**

Table 126 does not include low priority species such as bull thistle, mullein, cheatgrass, North Africa grass, or other species that are not tracked in databases kept by the Forest due to abundance. Canada thistle is also under-represented in Table 126 because the Forest stopped keeping records on small populations due to abundance.

Few noxious weed populations present in the project area can be treated with herbicides under the current authority of the Noxious Weed EA. Weed populations discovered or introduced outside the treatment units designated in 1998 cannot be controlled with herbicides due to lack of environmental analysis. An environmental impact statement is currently being prepared that would allow control of most populations of invasive plants using herbicides; the decision is expected in 2012.

The morphology of noxious weeds determines how a plant reacts to other control methods. Hand-pulling rhizomatous perennials such as whitetop and toadflax, is not effective, they are species that usually increase in density using manual control because new plants form from any root segments left in the soil after pulling the mature plant. Biennial plants can be reduced in density with diligent, twice-yearly manual pulling. Very small patches of medusahead can be controlled by diligent hand pulling throughout the growing season, however most infestations are too large to effectively pull the vast numbers of this annual grass. Species such as spotted and diffuse knapweed are perennial plants that have deep root structures and do not respond to manual control.

Most of the noxious weed sites within the project area are found along road corridors. From these points of initial infestation, weed species become opportunistic in invading suitable microhabitats adjacent to the initial infestation site. Exceptions to this include the Snowshoe area in the northwest corner of the project area, and Roba, which is located in the southeast. These two areas contain large infestations of houndstongue that has invaded riparian and forest habitats rather than roadsides. Most of the noxious weed species within the project area thrive in open full sunlight on disturbed soils in which native species have been diminished or displaced (conditions commonly associated with roads). Most of the noxious weed species listed in Table 126 are spread by vehicle traffic making road corridor weed sites of high concern. Medusahead and houndstongue are primarily spread by other means. These weeds are extremely competitive, have rapid spread rates and are moved around by wind, and animals in addition to vehicles. Low priority weed species, such as Canada thistle and bull thistle, also readily establish where soil and plant associations have been disturbed. These species, however, are not highly persistent and populations usually decline as the tree canopy closes and/or with competition from seeded/native species.

Direct and Indirect Effects – Alternative 1

All-terrain vehicles can affect the project area in two ways, the new introduction of invasive plants by bringing seed in from elsewhere, and the spread of established infestations in the planning area by creating disturbance. Travel Management rules allow vehicle use and camping

on most gravel and native surface roads. Exceptions include individual roads signed as closed to vehicle traffic, and areas such as Lookout Mountain Roadless Area. There are also seasonal closures of spur roads in the southern portion of the project area during fall and winter. OHV use in the east part of the project area is low, mostly local riders, with an increase during hunting season (personal observation). The western part of the project area receives more OHV use, presumably because it is closer to Prineville. There are no designated OHV trails within the area to draw riders specifically for recreational trail riding, and no designated trails are proposed in this alternative. Therefore, the probability of increase in establishment and spread of noxious weeds is equal to the current condition; vehicles would continue to be a vector of weed spread. No new trails that would provide susceptible environment for noxious weed establishment, and there would be fewer OHVs to act as vectors of weed spread.

The effects of the project on noxious weed introduction, establishment, and spread is indicated by the area of potential disturbance as measured in miles of designated roads and trails to be used for OHV routes within the project area. Table 127 indicates miles of potential disturbance by alternative and a description of effects in the sections following.

Table 127. Miles of designated trail, and number of gathering areas by alternative.

Alternative	1	2	3	4
Existing routes	0	46.4	13.8	53.2
Closed routes	0	43.2	29.4	61.1
Decommissioned routes	0	11.4	7.5	13.4
New routes	0	69.1	50.3	84.5
Total miles	**0**	***170.1***	***101***	***212.2***
Staging areas	0	10	4	10
Play areas	0	3	0	1
Parking areas	0	1	0	0
Trailheads	0	6	0	0
Total number of areas	***0***	***20***	***4***	***11***

OHV use would continue to occur under the No Action alternative. The resulting risk of weed introduction is moderate in the planning area. OHVs brought to the project area that are not clean may harbor weed seed and plant parts that can introduce new infestations. OHVs can also run through existing weed infestations, further spreading the population by creating additional disturbance for a seed bed, or picking up seed and carrying it to another portion of the area. There are several areas open to cross country travel (such as rock pits) within the Ochoco Summit project area that have noxious weed populations. These sites include Walton Lake Sno-Park, Crystal, Scotts Camp, Podo and Six Corners. OHV users that recreate in these areas are likely to cause new weed infestations in the project area.

No new trails would be designated or constructed within or adjacent to the Snowshoe or Roba areas. These areas have large populations of noxious weeds, primarily houndstongue, across the landscape. Less soil disturbance and fewer vehicles results in less risk of weed introduction and spread in this alternative.

Direct and Indirect Effects - Alternatives 2, 3, and 4

There has been a dramatic increase in OHV use in Oregon over the last 20 years. A publication by Lindberg (2009) for Oregon State Parks reports that there were nearly 139,000 in-state permits given out in 2008 for OHVs. Central Oregon is the 4th most used region for recreational riding in the state, with 382,218 trip days (including riders from out-of-state it is 449,668 trip days). Designating a trail system within the Ochoco Summit project area would increase the OHV use. The increased use of OHVs within the project area would increase the introduction and spread of noxious weeds for Alternatives 2, 3, and 4.

Seeds from many species of noxious weeds can be carried within the tread of tires or in cracks and crevices of motor vehicles and then become dislodged in other areas. A study done by Montana State University (Tayor 2011) determined that there is little difference in the number of seeds picked up by different vehicles. OHVs and passenger vehicles all collect the same number of seeds, and these seeds can remain attached to the vehicle after travelling 160 miles. It is then reasonable to assume that unwashed vehicles coming from other areas can bring new weed species to the project area. When tires of motor vehicles displace topsoil and damage vegetation, the resulting bare soil becomes potential sites for weed establishment. A Montana State University Extension Service Bulletin (1992) explains that rapid dispersal of weeds is characteristic of motorized routes where "ORVs can quickly spread 2,000 knapweed seeds over a ten mile area," and a 1998 bulletin states, "Protecting and conserving the surface soil are critical to the long-term sustainability of healthy, functioning ecosystems. In one study, runoff was 1.5 times higher and sediment yield was 3 times higher on spotted knapweed-dominated plots than on plots dominated by the native bluebunch wheatgrass. Loss of soil because of noxious weeds may have very serious consequences in the future" (Sheley et al. 1998). Healthy, functioning plant communities are critical for deterring the establishment of invasive plants.

Alternatives that propose more area open to motor vehicle travel and that have higher densities of designated routes pose a higher risk of noxious weed spread, introduction into new sites, and create greater challenges for detecting and controlling new weed sites. Table 9 displays the planned miles of designated trails for the action alternatives. Alternative 3 proposes the fewest miles of trail and the fewest number of gathering areas, somewhat lowering the risk of weed introduction compared to Alternatives 2 and 4. Alternative 3 also splits the use into two areas, without a designated connection between the two. In one of the two areas, the east side of the project area on the Paulina Ranger District, a motorcycle trail system would be designated where OHV use is currently low. This will increase the risk of weed introduction substantially for that area. Also, while Alternative 3 has the least amount of miles overall, it has the highest percentage (86%) of trails that will either open closed and decommissioned roads, or create new disturbance through trail construction. The density of trails on the west end of the project area is also the highest for Alternative 3. The above combination of factors gives Alternative 3 a high risk level for invasive plant establishment even though the Alternative proposes the least amount of trail miles.

Table 128 shows that Alternatives 2 and 4 would designate 170 miles and 212 miles of trail from Highway 26 across the Forest to Deep Creek Watershed on the Paulina Ranger District. Along with mileage differences for the two alternatives, there are also differences in the number of gathering areas. These are areas where use would be concentrated, and activities such as camping and play-riding for kids would take place. Anywhere that use is concentrated and various vehicle types are gathered, will increase the risk of weed introduction. Alternative 4 proposes 11 different gathering areas compared to the 20 proposed for Alternative 2, which has fewer miles of trail designated. This is in response to one faction of public comments about the project, saying more miles of trail are needed, and fewer trailheads, parking, and playing areas. Alternatives 2 and 4 are similar in the percentage of closed, decommissioned, and new routes, 73%, and 75% respectively. These two alternatives would expose new bare ground and also recovered vegetation on closed and decommissioned roads resulting in a high risk for invasive plant establishment.

Project design criteria require that trail construction and maintenance equipment be cleaned of all dirt and plant parts before entering Forest Service lands. This requirement would reduce the risk of introducing a new invasive plant population. Another possible form of weed introduction is through materials brought in to build trails (dirt, gravel, rock), or enhance trail difficulty. Enhancement often includes narrowing the trail or placing obstacles such as logs and boulders. A project design criteria requires materials to be weed free. This criterion is thought to be only

moderately effective because some materials clean better than others. For example, boulders can be cleaned, while logs and fill material is much more difficult to guarantee to be weed free.

As stated above, the type of activity, intensity and location of associated disturbance, and proximity to a seed source will affect the probability or risk of introducing noxious weeds. When ground and soil disturbance are likely to result in a measurable change from the existing condition, there is a high associated risk of introducing noxious weeds. Location of the proposed trail system is also important to the risk potential and associated effects. OHV use on the east end of the project area on Paulina Ranger District is currently low (personal observation). All alternatives propose trails circling the area surrounding Little Summit Prairie that was designated as a sensitive resource area by the Paulina District Ranger, and who recommended to prohibit off-road OHV use. This area contains important resource attributes including a major population center for Peck's mariposa lily, a Regional Forester's sensitive plant species; a high density of prehistoric archaeological sites; soils that have a high-risk for erosion; and one of the most interconnected habitats for redband trout, another Regional Forester's sensitive species. Although no trails are proposed directly within the Little Summit Prairie area, trail designation in close proximity, and increased use on all open roads would result in increased potential for invasive plant establishment and spread in an important resource area. This area, and others within the project boundary, is scab-stringer habitat, dominated by non-forested plant communities that have shallow clay soils. These areas have seen a dramatic increase in invasive winter annual grasses over the last six years (personal observation). *Ventenata dubia* (North Africa grass) in particular has spread, along with cheatgrass and medusahead rye. Theories on reasons for the increase include distance to infested roads and trails and the nature of soil properties. These heavier textured soils do not support vegetation that provides shade, soil temperatures are higher and the high clay content provides ample winter moisture for early growth of invasive grasses, while native grasses are still dormant (Riegel 2010). Increases in trail miles within or adjacent to scabland habitat is likely to increase the potential for spread of annual grasses.

Directly south of the Little Summit area is a very large infestation of houndstongue scattered throughout 19,000 acres (Roba). This species is spread through "Velcro"-like hooks on the seed, and is readily transported by clothing, vehicles, and animals. It germinates readily anywhere a seed is dropped on bare soil, and OHV trails would be vulnerable to houndstongue establishment. There is also a large infestation of houndstongue on the west end of the project area adjacent to the trail system proposed near Ochoco Divide Research Natural Area (Snowshoe). There is a high risk that houndstongue would be spread in this area as well.

Another element of risk that would have an effect on the potential for weed spread is the proximity to existing weed seed sources. Table 128 displays the trails and gathering areas directly within noxious weed infestations. Overall overlap within noxious weed locations is low. There are three weed infestations being crossed by trails, and 5 gathering areas within weed sites. Weed sites within the concentrated use areas (staging, etc) have the most potential for spread throughout the trail system. The gathering areas would receive intense use and seed would be carried down the trails radiating out of the area. Alternative 2 has the highest risk of spreading existing infestations as it has the highest number of trail/gathering/weed overlap.

Table 128. Summary of proposed trails and gathering areas within noxious weed infestations.

Infestation	Alternative 2	Alternative 3	Alternative 4
Diffuse knapweed #453	2 trail intersections, and Scotts Camp Trailhead	2 trail intersections	2 trail intersections
Spotted knapweed #828	1 trail intersection		2 trail intersections
Spotted knapweed #785	Walton Lake staging area	Walton Lake staging area	Walton Lake staging area

Canada thistle #691	Walton Lake staging area	Walton Lake staging area	Walton Lake staging area
Canada thistle #692	Walton Lake staging area	Walton Lake staging area	Walton Lake staging area
Russian knapweed #922	Walton Lake staging area	Walton Lake staging area	Walton Lake staging area
Spotted knapweed #197	Cottonwood Pit staging area	Cottonwood Pit staging area	Cottonwood Pit staging area
Canada thistle #198	Cottonwood Pit staging area	Cottonwood Pit staging area	Cottonwood Pit staging area
St. John's-wort #167	Staging area on FS road 42		Staging area on FS road 42
Diffuse knapweed #206	Play area on FS road 30		

All action alternatives would result in an increase of noxious weeds and other invasive plants across the project area. This in turn would result in additional expense for controlling invasive plants on the Forest. The nature of the proposal involves a constantly disturbed environment due to continued use of the trail system by vehicles coming from different parts of the state or country with a high probability of bringing in weed seed and plant parts. In 2007 it was estimated that in Central Oregon as a whole, there were approximately 52,000 visitors using trail systems (Ramming, pers. comm.). The North Millican OHV area had 9,985 riders in 2008, which has similar weather and predicted period of use as the Ochoco Summit proposed trail system (Skelton 2010). In the long-term, trail use is expected to increase by 2.5-5.6 percent per year (Skelton 2010). Using the low end of estimated increase in the first half of the decade (due to the current recession), and using the high end on the second half of the decade, it is estimated there may be 15,000 riders using the Ochoco Summit trail system by 2020. Concentrated and increased of use of the area will result in a constant need to monitor the trail system for noxious weed presence, and an increased need for treatment. As the Forest does not currently have the ability to use herbicides as a treatment method for new sites, manual control would be used which is more labor intensive and more expensive. As costs increase, the ability to inventory and monitor the trail system decreases, which limits the ability to catch the infestations while small. Controlling small infestations of most species is less expensive and more effective. Current budgets are not sufficient for the Ochoco National Forest to control all known infestations; due to the high risk potential of noxious weed establishment on an OHV trail system, it is not unreasonable to expect that the proposed trail system would further jeopardize the Forest's ability to detect and control weeds in the long-term.

Summary

Alternative 1 (no trail system) would not increase the potential for invasive plant establishment. Alternatives 2, 3, and 4 would increase the potential for invasive plant establishment. When ground and soil disturbance are likely, there is a high associated risk of introducing noxious weeds and other invasive plants. All action alternatives result in a high risk, with differences due to magnitude. The two measures used to differentiate between alternatives (miles of trail/number of gathering areas, and adjacency to existing seed source) show that Alternative 3 has a somewhat reduced potential for weed spread due to fewer miles of trail, fewer areas of concentrated vehicles in staging and parking, and less disturbance adjacent to existing weed infestations. Alternative 4, although proposes more miles of trail, has less risk and potential for weed spread than Alternative 2. This is due to fewer gathering areas, 11 staging/parking/play areas versus 20. These concentrated areas of use and collection of vehicles pose a greater potential for weed spread. Alternative 4 also proposes slightly less disturbance adjacent to existing weed infestations than

Alternative 2. Alternative 2 has the highest potential for weed introduction and spread and associated expense of treatment.

Cumulative Effects

Alternative 1 does not propose a trail network or disturbance, and as a result there are no cumulative effects. This alternative will not be carried further in the cumulative effects discussion. Cumulative effects are the same under Alternatives 2, 3, and 4 with only the variance in the direct and indirect effects.

Past road construction and maintenance, grazing, timber harvest and other soil disturbance have provided environments for noxious weed species establishment, vectors for noxious weed dispersal, and infestations of noxious weeds as seed sources for spread. Past activities within the analysis area have resulted in moderate amounts of weed infestations occupying 2,090 acres. Over 1,400 acres of this is houndstongue, which is difficult to control and easily spread by a number of vectors, including vehicles.

The potential for noxious weed establishment and spread from passenger vehicles not associated with the project along open road corridors (including seasonally open roads) would continue. The potential for other vectors of spread within the project area including people, wind, or animals would also continue.

Specific on-going activities in the project area are similar to past actions including timber harvest, precommercial thinning, prescribed burning, grazing, OHV use, and other forms of recreation such as hiking, horseback riding, and camping, all of which introduce and spread noxious weeds. Known sites are treated based on priority; effectiveness of the treatment depends on the species and control method – pulling or herbicide (if approved for herbicide treatment).

In addition to the current activities within the project area, adding 101 to 212 miles of designated OHV trail would result in cumulative impacts to native vegetation from invasive plants. OHV travel is allowed on designated routes within most areas of the Ochoco Summit Trail project area, and use is increasing. The proposed designated trail system is adjacent to several large houndstongue infestations. Based on the phenology and mechanism of spread of this particular weed, there is a high risk that the trail system would cause additional disturbance that would provide an optimal seed bed for germination. Designating a trail system would increase the intensity and extent of use in an area susceptible to weed invasion faster than use is occurring at present. The Forest does not currently have the ability to control noxious weeds using the most effective method, herbicide; this increases costs and limits the amount of treatment possible. These factors would cumulatively result in expanding noxious weed populations.

Future actions that have the potential to incrementally increase the risk of weed introduction are the Canyon and Jackson Vegetation Management EISs are currently in the NEPA process and include projected management acreage that overlaps with the Ochoco Summit OHV project area. Approximately 20,000 to 30,000 acres of vegetation and fuels management may be proposed for treatments including commercial thinning, small diameter thinning and prescribed burning. Of these activities, commercial harvest and fuels management (either burning or piling) would produce bare ground that is susceptible to invasive plant establishment, including species such as North Africa grass, medusahead and cheatgrass. Timber harvest may also require the construction of temporary roads to access units, and currently closed roads may be used for haul routes during timber harvest operations. Collectively, these actions would have a short-term (3-5 years) increase in susceptible area until bare ground is revegetated.

Implementation of the Travel Management Rule of 2005 became effective December 30, 2011. The Deschutes and Ochoco Travel Management Plan is currently in the enforcement stage; and under this forest-level travel management plan, motorized use will be restricted to designated

OHV trail systems and those Level II roads open for passenger vehicle travel. Cross-county OHV travel is no longer be allowed within the project area. This will lessen the cumulative impacts of the Ochoco Summit trail system in two ways. It will make it illegal to create new trails modifying those proposed for Ochoco Summit. For example there would be less potential for riders to cut across the loop around Little Summit Prairie, a sensitive resource area, in order to shorten the ride. Prohibiting the ability for users to create their own trails will reduce disturbance to native vegetation, and reduce the amount of exposed soil, thus lowering the risk of creating a susceptible seed bed for weed establishment. Implementing the Travel Rule will also concentrate OHVs as a vector of spread to areas designated in Alternatives 2, 3, and 4. This will help limit the scale of risk to a known location, facilitating surveys and weed control. It may however increase the intensity of use, more vehicles means more risk of weed introduction and spread.

The Ochoco/Deschutes NFs Invasive Plant Treatment is a proposal currently in the NEPA process that would increase the ability to effectively control invasive plants with herbicides. The ability to use herbicides would increase efficiency, thus lowering costs, which results in the ability to treat more acres for the same costs. This proposal does not synergistically interact with the proposed trail system, but does help reduce the extent and duration of effects of noxious weeds on native vegetation. Herbicide is more effective on difficult to control species such as annual grasses and rhizomatous species, resulting in smaller infestations and lower plant densities.

Special Plant Habitats

Introduction

Special plant habitats are areas which sustain unusual and/or particularly rich biological diversity. These habitats have a high probability of supporting rare species. All non-forest and riparian habitats are often treated as special habitats because they encompass such a small percentage of the land base in forested regions but have a disproportionate value in the conservation of biological diversity (USDA Forest Service 1996). For example, riparian areas where hardwood species are found usually constitute about 1-2% of the landbase on the Forest, yet riparian habitats are abundantly used for recreation such as camping, fishing and hiking. For this analysis, Hardwoods, meadow, rock outcrops, shrub-scablands, and grasslands will be considered special habitats.

Regulatory Framework

The Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by NFMA of 1976 requires National Forests to provide for the diversity of plant and animal communities. Forest Service direction for managing habitats for all existing native and desired non-native plants in order to maintain viable populations of species comes from Forest Service Manual 2600 (USFS 1995, WO Amendment 2600-95-7. Direction for Research Natural Areas is found in Forest Service Manual 4063.04b, which gives direction to manage and protect all RNAs and allow natural processes to occur for research and education.

The Ochoco NF Land and Resource Management Plan addresses some facets of special habitats and biological diversity, such as riparian areas, connective habitat, snags, old growth, RNAs, non-forest plant communities including scablands, and sensitive plant and animal species. This analysis will look at a subset of these as described in the introduction. The LRMP does not specifically identify a desired future condition for the biological diversity of plant species. It does address riparian areas, which provide important habitat for many sensitive species within the Project Area. The LRMP states that most of the riparian areas will be in excellent condition within 50 years, characterized by vigorous stands of forbs, grasses, and grass-like species on

stable stream banks. It also addresses scablands, and recognizes them as fragile areas adversely affected by management activities.

Analysis Methods

Hardwoods will include cottonwood, aspen, alder, and willow communities. Meadows include dry, moist and wet meadows that have saturated soils for some of time during the year. Rock outcrops are exposed rocks that are large enough to be mapped in GIS. Shrub-scablands include non-forested areas dominated by low and rigid sagebrush and Sandberg's bluegrass. Unique grassland areas include those dominated by Sandberg's bluegrass and one-spike oatgrass. The Ochoco Divide Research Natural Area will be included in the discussion due to its special status and proximity to proposed trails. Effects of the proposal will be measured by:

- Acres/miles of special plant habitat impacted by proposed trails and gathering areas.

Effects of new trail construction and re-construction of revegetated closed roads will be analyzed for short-term effects of 3-5 years. Use is expected to continue on all trails for the long term, >10 years.

Assumptions:

- Areas open to motorized recreation have a higher risk of impacting vegetation, including special plant habitats.
- All forms of motorized vehicles are lumped together in the analysis, regardless of class of vehicle.
- Areas that are seasonally closed were analyzed as open because there can be impacts to native plants and native plant habitats regardless of when the area is open. If the area is not 100% closed all year long, it is considered open.
- All forms of motorized vehicles are lumped together in the analysis, regardless of class of vehicle. Trails are considered to be 10-feet wide, regardless of class of vehicle, to account for effects from microclimate changes, dust, vehicles passing, etc.
- Calculated acres of hardwood communities are based on potential, and stands are not necessarily currently fully occupied by hardwood species.

Existing Condition – Special Plant Habitats

The texture and pattern of biodiversity can be examined at many different scales, ranging from global to microscopic. At the landscape scale, the coarse scale of Plant Association Groups was used to calculate the amount of special habitat within the project area (see Table 129). This course scale using GIS can miss unusual small scale habitats such as an individual dead tree or root wad, which can provide habitat for rare species of fungi, bryophytes, and lichens. That fine scale of biological diversity will not be analyzed.

Hardwoods – This type is dominated mostly by quaking aspen (*Populus tremuloides*) stands. Black cottonwood (*Populus trichocarpa)*, mountain alder (*Alnus incana*), and willow (*Salix* species) make up a small amount of the acreage listed in Table 11. These deciduous hardwood trees and shrubs provide a variety of important ecological functions, diversification of landscape patterns, and habitat for many other species (USDA Forest Service 1997). Riparian communities made up of these species are extremely diverse in plant life since they initiate forest succession, and thus provide great structural diversity. Hydrologically, hardwoods provide excellent stability to stream banks and soil surfaces. Their deep and spreading root systems can resist flood pressures and slow water velocity. They provide shade to help maintain stream temperatures, and abundant leaf shedding in the fall increases soil fertility.

Aspen and cottonwood are short-lived, early seral species that rely on disturbance for establishment. Black cottonwood has been declining due to conversion of floodplain vegetation to agricultural uses, changes in stream systems (confining streams into a single channel), over browsing by livestock, elk and deer, and conifer encroachment (USDA Forest Service 1997). Quaking aspen, alder and willow are declining as the result of conifer encroachment and increasing density, over browsing by livestock, deer and elk, and loss of habitat where the water table as dropped due to stream downcutting.

Meadows (wet, moist and dry) – Meadow communities are found in areas where ground water is higher than that found on the surrounding upland sites, such as a spring. They can also include perched water table areas within stream communities. Meadows communities include moist meadows, where moisture is available in the rooting-zone during the growing season, but drops 1-3 feet in the fall, and wet meadows, where available water is at or near the surface all season long (Hall 1989). Dry meadows have no standing water and dry out completely in the summer.

Rock – these are areas of exposed surface rock (pavement), outcrops, or boulders. Dry rock habitats occur when plants establish themselves in soil deposited between rocks. Many plants found here are also found in dry forest and even moist forest habitats; however, some plants occur only when a dry rock habitat receives ample moisture in the spring before drying up in summer. Lichen, mosses, ferns, scarlet gilia, wild rose, ninebark, oceanspray, and smooth sumac, are often found here. This plant habitat is unique, including ephemeral meadows formed by filling of rock pools, and "hanging" clumps of vegetation developed in soil that accumulates in stepped, pocket-like depressions along outcrops and boulder fields.

Shrub-scabland – These non-forested habitats have rocky, shallow soils and are commonly found on topographically high sites such as ridges. Dominated by scattered sagebrush, bunchgrasses, and forbs, these sites are particularly exposed to summer heat and dryness, winter cold, and spring frost-heaving. Occasional species include mountain mahogany and juniper. Scablands are recognized as among the most fragile ecosystems on the Ochoco National Forest. Damage to the soil and vegetation as a result of management activities is nearly impossible to mitigate. Revegetation is nearly impossible due to water saturation and frost heaving (LRMP 1989).

Grassland – These are also scabland habitats, but are even drier and have shallower soils than shrub-scabland described above, and have the highest combined surface rock, pavement, bareground percentage (63%) of any grassland in the Blue and Ochoco Mountains (Johnson and Clausnitzer 1992). This habitat is dominated by Sandberg's bluegrass and one-spike oatgrass. Forbs include low pussytoes, yarrow and bisquitroots.

Table 129. Acres of special habitat within the Ochoco Summit project area.

Special Habitats	Acres	Percent of total area
Hardwood	2,046	0.7
Meadows	8,705	3
Rock	1,668	0.6
Shrub-scabland	41,296	14
Grassland	5,897	2

Biological soil crust is present in scabland and grassland habitat where there are significant areas of open space between vegetative clumps that are exposed to the elements. Erosion in these areas is controlled by pebbles and communities of nonvascular or cryptogamic plants that grow upon or immediately beneath the solid surface. Where established and undisturbed, the cryptogams form a recognizable crust. These plants, made up of algae, lichens and mosses play an important role in soil stabilization (Anderson et al 1982). This crust is a unique feature to semi-arid conditions within scabland habitat.

Research Natural Areas - (RNAs) are part of a national network of ecological areas designated in perpetuity for research and education and/or to maintain biological diversity on National Forest System lands (Forest Service Manual 4063). RNAs are managed such that natural physical or biological processes are allowed to prevail without human intervention. According to FSM 4063.3, standards, management of an RNA must support and promote the basic objectives and purposes of establishing the area.

Overall objectives for RNAs are to maintain a wide spectrum of high quality representative areas of the major forms of variability found in forest, shrublands, grasslands, alpine, and natural situations, to preserve and maintain genetic diversity, and to protect against human-caused environmental disruptions. Each RNA contains representative or unique natural features in a relatively undisturbed condition. The designation of these areas provides long-term protection and recognition of their natural values for research and baseline ecological study, observation, and conservation of biological diversity. The Ochoco Divide RNA is present within the project area and was chosen to represent the ponderosa pine-Douglas fir and grand fir-western larch-Douglas fir plant associations.

There would be no change to the management of RNAs, regardless of the chosen alternative. These areas are not open for motorized travel off of designated routes nor motorized access to dispersed camping. It is included in the analysis due to the proximity of the proposed trail system and invasive plant populations.

Direct and Indirect Effects – Special Plant Habitats – Alternative 1

Alternative 1 is the No Action Alternative; no trail system would be designated, and no staging or associated camping areas would be developed. The current management policy is that many roads within the project area are open to travel by motorized vehicles, and cross-country travel is prohibited. This policy would remain in effect in this alternative. Areas not open to off-road use includes Ochoco Divide RNA, Bridge Creek Wilderness, and Lookout Mountain Roadless Area. Most of the OHV use in the project area occurs on roads (personal observation), where the disturbance to native vegetation from the construction of the road is a past action. There are some areas where user-created trails are increasing, especially on the west side of the planning area closest to Prineville. The amount of both on and off road use is expected to continue as the popularity of OHV use continues to increase and the population of Prineville and the surrounding area continues to increase. Even though OHV use is expected to increase, the effects under Alternative 1 are minor, because the roads open for travel are already established, and no new disturbance would take place. Minor effects from dust would affect plants along the roadsides (see the effects section below for more detail)

General Effects Common to all Action Alternatives

Direct impacts on vegetation caused by vehicles include crushing of foliage, root systems, and seedlings (Wilshire et al. 1978b). Plant foliage and stems can be damaged and plants uprooted by vehicles, so that actual plant damage may occur over an area much larger than the track width. Indirect effects of vehicles on vegetation include undercutting of root systems as vehicle paths are enlarged by erosion (Wilshire 1978a). Secondary effects from disturbance include the proliferation of exotic plant species and a higher frequency of fire (Lovich and Bainbridge 1999). Effects of these impacts include alteration or destruction of macro- and micro-vegetation elements, establishment of annual plant communities dominated by exotic species, destruction of soil stabilizers, soil compaction, and increased erosion.

Indirect effects can be invasion by invasive plants into disturbed areas which then compete with native plants. In general, grasslands, riparian areas, and relatively dry, open forests are more susceptible to invasion than are dense moist forests and high montane areas (USDA Forest

Service 2005a, p. 3-40). The former have frequent gaps in plant cover, which favor invasive plant establishment, whereas the latter have relatively closed plant cover or have extreme climate or soils, which are tolerated by fewer invasive plant species. Invasive plants tend to colonize disturbed ground along roads, highways, along trails, and in campgrounds and quarries. Once established, invasive plants begin to spread, displacing native vegetation. Eastside forests are more susceptible to invasive plants for the above reasons.

Motorized use, especially concentrated and repeated use, can degrade native plant habitats by denuding areas of understory vegetation and compacting soils. Of particular concern are special habitats, those which sustain unusual and/or particularly rich biological diversity. People are drawn to unique places such as aspen stands, meadows, and rock outcrops; scablands often provide vistas due to their ridgetop location. Visiting these areas by motor vehicle can have a lasting impact to areas of fragile soils, including damage to biological soil crust. When soils are severely disturbed, vegetation cover can be reduced significantly and plant growth can be impaired (reviewed in Ouren et al. 2007). Davidson and Fox (1974) reported significant loss of herbaceous vegetation from motorcycle activity. Bolling and Walker (2000) reported that track roads had significantly lower total vegetative cover than control areas. Total plant density and cover were significantly lower in roads than in controls in the Mojave Desert, and long-lived plant species were greatly reduced in disturbed areas compared to controls (Prose et al. 1987).

Several special habitats are particularly susceptible to invasion of non-native annual grasses (medusahead, cheatgrass, and North Africa grass) including the dry meadows, shrub-scabland and grassland habitats.

Direct and Indirect Effects – Special Plant Habitats – Alternatives 2, 3, and 4

The Ochoco Summit project proposes a designated trail system, and accompanying trailheads, campgrounds, staging areas, parking areas and play areas (herein called gathering areas). Alternatives differ in the number of miles, trail location, and number of gathering areas. Effects to sensitive areas are similar between alternatives, varying by magnitude of interaction.

The action alternatives are expected to increase off road vehicle use, increase number of riders, and provide associated facilities that would impact special habitats.

Relatively low recreational traffic intensities cause a significant drop in plant cover, plant height, species richness and species diversity, leading to an increase in soil compaction and a decrease in soil organic matter and moisture content (reviewed in Kutiel et al. 2000). Kutiel et al. (2000) studied the response of soil and annual plants to various intensities of short-duration pedestrian and motorcycle traffic, and found that motorcycle passage had an immediate detrimental impact on annual plants at all traffic intensities.

Secondary effects from disturbances, such as off-highway vehicle use, include the proliferation of exotic plant species and a higher frequency of fire (Lovich and Bainbridge 1999). Effects of these impacts include alteration or destruction of macro- and micro-vegetation elements, establishment of annual plant communities dominated by exotic species, destruction of soil stabilizers, soil compaction, and increased erosion.

Table 130 displays the number of trail miles and converted acres (at 10’ width of disturbance) within special habitats. The effect of trails on hardwood communities appears low, 0.6 acres for alternatives 2, 3 and 4; however the pattern and location of the trails may have an effect beyond direct overlap with hardwoods. There are ten black cottonwood stands within the 300,000+ acre project area. This project proposes trails within or directly adjacent to three of them, including one that would have new trail built through it. Hardwood communities provide aesthetic enjoyment to humans, and aspen and cottonwood stands are particularly important to biological diversity. They provide important foraging, nesting, breeding, and resting sites for a wide variety

of birds and mammals. In addition to the effects on vegetation within hardwood stands, noise may be a factor effecting wildlife (see the EIS Chapter 3 wildlife section). The network of trails shown in Figure 3 shows the adjacency to the many aspen stands in the west end of the planning area.

Table 130. Acres and miles of proposed trails located within special habitat.

Alternative	1	2	3	4
Hardwood	0 acres 0 miles	0.6 acres 0.5 miles	0.6 acres 0.5 miles	0.6 acres 0.5 miles
Meadows	0 acres 0 miles	2.4 acres 2.02 miles	2.5 acres 2.1miles	4.1 acres 3.35 miles
Rock	0 acres 0 miles	1.3 acres 1.1 miles	0.7 acres 0.6 miles	1.6 acres 1.3 miles
Shrub-scabland	0 acres 0 miles	29.1 acres 24.0 miles	10.8 acres 8.9 miles	33.2 acres 27.4 miles
Grassland	0 acres 0 miles	10.3 acres 8.51 miles	5.6 acres 4.75 miles	9.3 acres 7.7 miles
Total	*0 acres* *0 miles*	*43.7 acres* *36.1 miles*	*20.2 acres* *16.8 miles*	*48.8 acres* *40.25 miles*

In addition to the planned trails, the facilities to support the trail network would also occur within special habitats. Table 131 shows the number of gathering areas (staging, playing, trailheads, etc) planned for each alternative. Most of the planned facilities fall within special habitat:

- Alternative 2 - 17 out of 20 areas within special habitat
- Alternative 3 - 3 of 4 areas within special habitat
- Alternative 4 - 10 of 11 areas within special habitat

Some of these locations are on large, already-disturbed sites, such as Marks Creek and Walton Lake Snoparks, and Six Corners material source, where direct effects to vegetation would be negligible. Other sites would have impacts as developed recreation facilities are added. Impacts to special habitat may come from unauthorized riding from these points, where use can radiate out in many directions (see Figure 2). Matchett and others (2004) point out that OHV use may be heaviest on slopes, along right-of-ways, in washes, and in the vicinity of camping facilities.

Table 131. Number of gathering areas within special habitat.

Alternative	1	2	3	4
Staging areas	0	10	3	9
Play areas	0	3	0	1
Parking areas	0	1	0	0
Trailheads	0	3	0	0
Total number of areas	*0*	*17*	*3*	*10*

Effects to rock habitat would be low; regardless of the Alternative, less than two acres would be impacted by trails or gathering areas (0.1% of the rock in the project area). New trail proposed through rock habitat include 0.5 miles, 0.25 miles, 0.5 miles for Alternatives 2, 3, and 4 respectively. The fractured basalt in the project area does not provide the large boulders desired by jeeps for “rock crawls”. Trails would however, be designed to go through rock habitat to provide roughness and difficulty. Many of the rock areas in project area are cliffs and rimrock, which have stepped, “hanging” vegetation would not be impacted.

Meadow and scabland soil and vegetation are vulnerable to disturbance by vehicles. Driving through these areas, especially when wet leads to rutting and soil compaction. Natural recovery rates following disturbance depend on the nature and severity of the impact but are generally very slow. Recovery to pre-disturbance plant cover and biomass may take 50-300 years, while complete ecosystem recovery may require over 3,000 years (Lovich and Bainbridge 1999). Table 12 shows that Alternatives 2 and 3 impact about 2.5 acres of the 8,705 acres present in the project

area; and roughly 4 acres are impacted in Alternative 4. Within meadows, most of the trail miles would occur on previously closed or decommissioned roads, where the impact to soils and vegetation have already occurred, especially soil compaction; however recovered vegetation would be impacted. Meadows are also open areas, where keeping traffic on the trail may be more difficult to enforce. Approximately one-half mile of new trails would be built through meadows in Alternative 2, and one mile each in Alternatives 3 and 4. Effects to meadows would be long-term, but small in magnitude.

Scabland soils (both shrub-scabland and grassland special habitats) are fragile ecosystems where damage is nearly impossible to mitigate (USDA 1989). The Ochoco National Forest LRMP states that the transportation system in scablands will be limited to long-term roads because of the inability to restore the impact of the road. Once a trail is constructed through the scabland or grassland, the effect is permanent. Design criteria (see EIS Chapter 2) meant to limit resource damage, such as closing trails if erosion or soil displacement is occurring, have little effect in this situation due to length of recovery period for scabland soil and vegetation. Belnap (1995) discuss how desert soils may recover slowly from surface disturbances, resulting in increased vulnerability to desertification. As a result, recovery from compaction and decreased soil stability is estimated to take several hundred years. The nitrogen fixation capability of soil requires at least 50 years to recover (Belnap 1995).

Combining shrub-scabland and grassland special habitats as having similar vegetation and soils, Table 130 shows that there are 32.5 miles of trail proposed in Alternative 2, 16.6 miles in Alternative 3, and 35 miles in Alternative 4. Off-road vehicle activity has been shown to greatly increase soil compaction in areas of intense traffic (Adams et al. 1982). Soil characteristics, particularly soil compaction, play important roles in the distribution, abundance, growth rate, reproduction, and size of plants. Even a few passes by vehicles can cause significant changes in soil properties (Ouren et al. 2007). Adams et al. (1982) found reduced cover of desert annuals in tracks created by as few as one (on wet loamy sand) to 20 (on dry loamy sand) vehicle passes; the reduction in cover, however, was not due to fewer plants, but to smaller plant sizes. With tracks made by 1, 3, 10, and 20 vehicle passes, Adams et al. (1982) found that annuals with large taproots decreased, whereas there was significantly greater cover of a non-native, fibrous-rooted grass. The fibrous root system allows for easier germination and root growth than large-taprooted species. Overall, the extent of immediate effects increases with the frequency of OHV passes. For example, Webb (1982; reviewed in Ouren et al. 2007) found that after a single pass, annual plants on an OHV route remained intact, but most were destroyed after 10 passes.

In addition to effects to soil and herbaceous vegetation, biological soil crust is impacted by OHV use. Maintaining soil stability and normal water and nutrient cycles in desert systems is critical to avoiding desertification (Belnap 1995). Soil compaction and disruption of biological soil crusts can result in decreased water availability to vascular plants through decreased water infiltration (Belnap 1995). Biological soil crusts are a complex mosaic of cyanobacteria, green algae, lichens, mosses, microfungi, and other bacteria. In rangelands, they function as living mulch by retaining soil moisture and discouraging annual weed growth (Belnap et al. 2001). Biological crusts are an important component of desert ecosystems, as they influence soil stability and fertility (Belnap 2002).

Once disturbed, natural recovery rates were found to be very slow (Belnap 1993). Recovery of biological soil crusts can be hampered by large amounts of moving sediment, and re-establishment can be extremely difficult in some areas. The rate of recovery for some components of biological soil crusts were significantly hastened on areas inoculated with surrounding biological crust material, however, lichen and moss recovery was minimal.

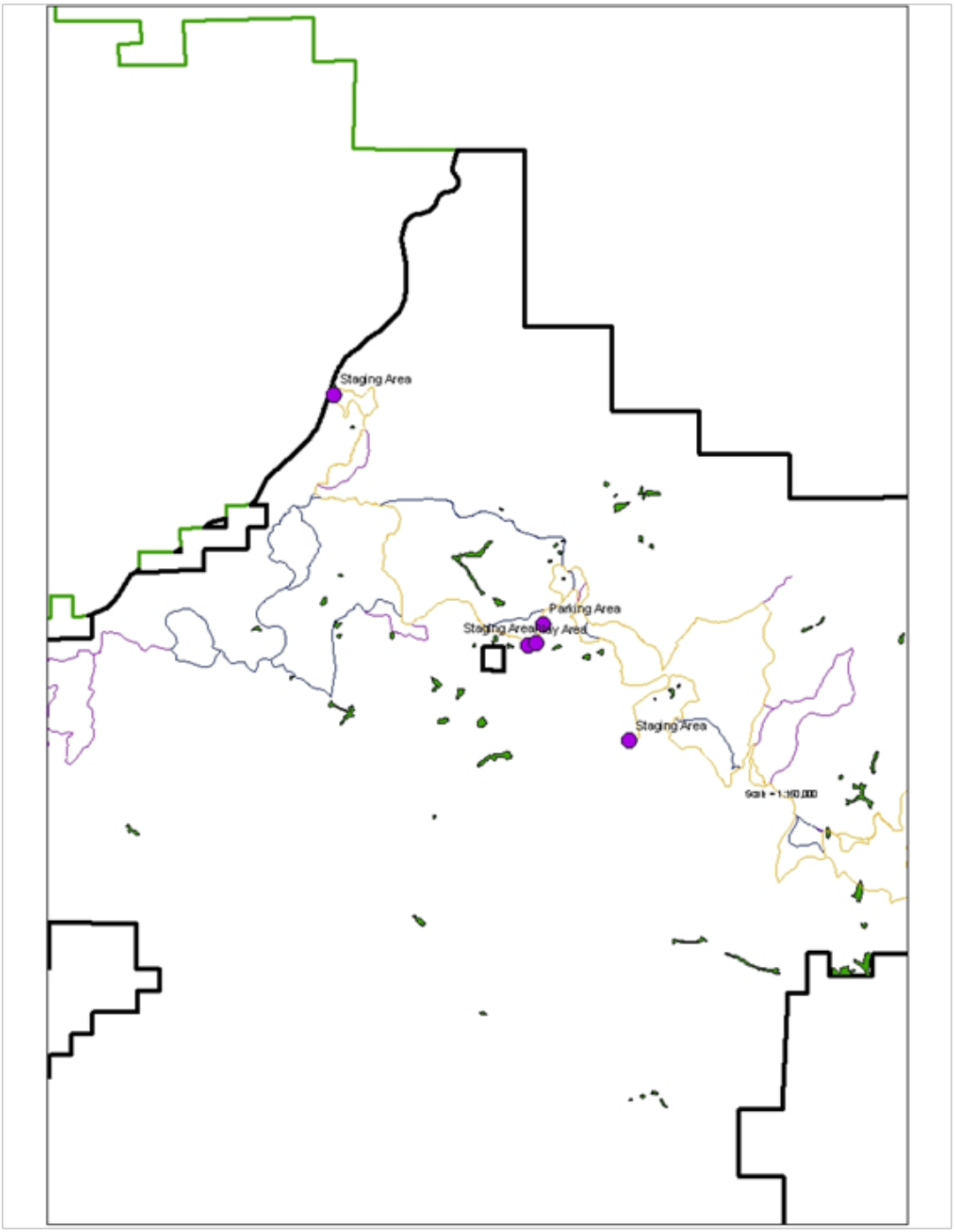
Belnap et al. (2001) also discuss how invasive plants affect biological soil crusts by reducing the diversity of native vascular plants. The risk of invasive plants spread by the project is high (see the Invasive Plants section of this document). The vertical and horizontal vascular plant structure of many arid and semi-arid vegetation communities optimizes growth of biological soil crusts. Vascular plants create windbreaks and shade, influencing how much moisture and light reach the soil surface. They also trap leaf litter, keeping the interspaces free of substantial or persistent litter cover. Invasive exotic plants generally decrease the structural diversity of native vascular plant communities by creating monocultures of densely spaced plants and by homogenizing litter distribution. They also lead to decreased biological crust cover and species richness in most ecosystems.

Invasion of exotic annual plants into perennial plant communities can pose a long-term threat to biological soil crusts, as the crust-dominated interspace between perennial plants is often heavily invaded. Because biological crusts stabilize soils, germination of seeds of exotic species can be inhibited in sites with well-developed crusts and low plant litter, as was recently demonstrated for the annual exotic grass, cheatgrass (*Bromus tectorum*) (Belnap 2001). Kaltnecker et al. (1999) found that areas with intact biological soil crust cover maintain low cheatgrass densities despite abundant seed sources nearby. In contrast, native species that have evolved with biological soil crusts may have mechanisms, such as a geniculate awn that drills the seed into the soil. Shrub-scabland and grasslands within the project area are experiencing a recent increase in the density of invasive grasses, including cheatgrass, North Africa grass, and medusahead rye.

Effects to shrub-scabland and grassland habitat, including biological soil crust, would be long-term to permanent, but small in magnitude, with the most potential impact occurring near gathering areas. Acreage-wise there would be little scabland area affected, 39 acres, 16.4 acres and 42.5 acres for Alternatives 2, 3, and 4 respectively, out of 47,193 acres present within the project area.

Research Natural Area

The Ochoco Divide RNA is within the project boundary; no trails are proposed with the RNA itself. Direct effects to vegetation within the RNA are not expected. The risk of indirect effects from invasive plants is expected to increase as a result of the project. Alternative 3 proposes ¾ mile of new trail along the south RNA boundary, which is also directly adjacent to a houndstongue population. There are already houndstongue infestations within the RNA in the southeast corner, and all along the northern boundary. For all alternatives, OHV traffic out of the Marks Creek Snopark staging area may increase the risk of spreading the northern populations into the RNA from use of the 26-600 road system.



Yellow = proposed trails in Alternative 2
Purple = additional proposed trails in Alternative 3
Blue = additional proposed trails in Alternative 4

Figure 3. Aspen stands (dark green) on the west end of the Ochoco Summit Project Area in relation to proposed trail locations and gathering areas.

Cumulative Effects – Special Plant Habitats

Alternative 1 does not propose building and designating trails within special plant habitats, or other disturbance, and as a result there are no cumulative effects. This alternative will not be carried further in the cumulative effects discussion. Cumulative effects are the same under Alternatives 2, 3, and 4 with only the variance in the direct and indirect effects.

Past road construction and maintenance, grazing, timber harvest and other disturbance have impacted special habitats. Hardwood communities have decreased in stand size and health, and have become fragmented, due to lowered water tables. Moisture regimes in meadows have been altered by grazing and road construction. Dry meadows are becoming smaller due to conifer encroachment as a result of fire suppression. Shrub-scabland and grassland plant communities have been altered by invasive plants.

On-going activities will continue across the project. Specific on-going activities in the project area are similar to past actions including timber harvest, precommercial thinning, prescribed burning, grazing, recreation such as hiking, horseback riding, and camping, all of which impact special plant habitat. Some of these actions have positive impacts, such as conifer removal within aspen stands, and juniper encroachment removal in shrub-scablands. Personal observations of current OHV use in the project area see that some OHVs are damaging special habitat. Observations such as ruts in meadows, and hill-climbs on scabland habitat are not uncommon. OHV use in the spring is especially damaging to the soft soil in meadows and scablands. This damage is not limited to OHVs; passenger vehicles also engage in “mud bogging” as a form of recreation.

In addition to the current activities within the project area, adding 101 to 212 miles of designated OHV trail would result in small scale cumulative impacts to some special habitats, including meadows, shrub-scabland, and grassland. Hardwood plant communities are not expected to be cumulatively impacted by the proposed trail project. Noise effects to the wide variety of wildlife using this habitat may be a cumulative effect (see the Wildlife section in Chapter 3 of the EIS). The effects of the project on rock habitat is ½ acre at most from Alternatives 2 and 4, this is not a cumulative impact as there are no other activities affecting rock habitat. Trails through meadows and shrub-scabland would increase soil compaction, damage biological soil crust, and affect native plants as described under the Alternatives. Due to the narrow linear nature of these trails, the amount of area affected is small. These habitats are very open, and there is a risk of OHVs leaving the designated trail, becoming an enforcement issue, and increasing the amount of special habitat affected.

A risk of cumulative impacts to special habitats comes from the increase and spread of invasive plants. The proposed designated trail system is adjacent to several large houndstongue infestations. Based on the phenology and mechanism of spread of this particular weed, there is a high risk that the trail system would cause additional disturbance that would provide an optimal seed bed for germination. Designating a trail system would increase the intensity and extent of use in an area susceptible to weed invasion faster than use is occurring at present. The Forest does not currently have the ability to control noxious weeds using the most effective method, herbicide; this increases costs and limits the amount of treatment possible. These factors would cumulatively result in expanding noxious weed populations.

In addition to the current activities within the project area, adding 101 to 212 miles of designated OHV trail would result in small scale cumulative impacts to some special habitats, including meadows, shrub-scabland, and grassland. Hardwood plant communities are not expected to be cumulatively impacted by the proposed trail project. Noise effects to the wide variety of wildlife using this habitat may be a cumulative effect (see the Wildlife section in Chapter 3 of the EIS). The effects of the project on rock habitat is ½ acre at most from Alternatives 2 and 4, this is not a

cumulative impact as there are no other activities affecting rock habitat. Trails through meadows and shrub-scabland would increase soil compaction, damage biological soil crust, and affect native plants as described under the Alternatives. Due to the narrow linear nature of these trails, the amount of area affected is small. These habitats are very open, and there is a risk of OHVs leaving the designated trail, becoming an enforcement issue, and increasing the amount of special habitat affected.

Future actions that have the potential to incrementally increase the risk of weed introduction are the Canyon and Jackson Vegetation Management EISs are currently in the NEPA process and include projected management acreage that overlaps with the Ochoco Summit OHV project area. Approximately 20,000 to 30,000 acres of vegetation and fuels management may be proposed for treatments including commercial thinning, small diameter thinning and prescribed burning. It is unknown at this time what special habitat may be directly affected by these activities. Commercial harvest and fuels management (either burning or piling) would produce bare ground that is susceptible to invasive plant establishment, including species such as North Africa grass, medusahead and cheatgrass. Timber harvest may also require the construction of temporary roads to access units, and currently closed roads may be used for haul routes during timber harvest operations. Collectively, these actions would have a short-term (3-5 years) increase in susceptible area until bare ground is revegetated.

Cultural Resources

History

The Ochoco Mountains form the headwaters for the Crooked River. Drainages including tributaries join the North Fork of the Crooked River as it winds its way through Big Summit Prairie. Likewise tributaries join Little Summit as they feed the wetlands at Little Summit Prairie eventually joining in with Deep Creek drainages and making their way into the North Fork of the Crooked River. These waters, along with the Wolf Creek drainages, flow from the high ridges of the Ochocos through forested uplands to the main stem of the Crooked River in the Deschutes basin. Big Summit Prairie and Little Summit Prairie were especially important to both Indian People and early Anglo settlers for their abundant resources and water. The Ochoco Mountains offered high elevation country in contrast to the arid shrub-steppe lowlands common along the main stem of the Crooked River which makes the high desert country so unique.

Indian people have occupied these upland areas since time immemorial. Archaeological evidence documents the intensive use in and around Big Summit and Little Summit Prairies. The uplands extended seasonal hunting and gathering activities and provided valuable resources. Camas and a variety of other root crops could be dried and stored to sustain these groups through the long cold winters common to the high desert. The North and South Fork of the Crooked River provided north-south access routes between obsidian resources to the south and upland areas like the Ochoco Mountains and their mountain prairies. This area has primarily been occupied seasonally due to cold winters and snowfall. Indian occupation was subsistence based with the more recent. The dominant cultural theme in this area is represented by a long period of Indian occupation. A variety of site types represent a mobile hunting and gathering lifeway dependent on upland resources as part of their seasonal rounds. Site types vary from surface lithic scatters to more complex sites with formed tools and features like house pits, camas ovens and peeled trees. Traditional resources continue to available and gathered today. Traditional foods include root crops like camas, bitterroot, Indian celery, lomatium species, and other foods and resources like hanging black moss, yellow bells, wyethia, and chokecherry along with a host of other plants and faunal resources.

The influx of Anglo-settlement changed cultural patterns in the mid-1800s. Anglo-settlement occupation was based on stock grazing, agricultural practices and forest products. Stock grazing and agricultural practices were introduced to this area in the late 1800s with the influx of Anglo exploration and settlement. The high elevation meadows provided excellent stock grazing opportunities and attracted early homesteaders. By the 1930s for a variety of reasons the population shifted to larger trade centers and communities like Prineville and Mitchell. Changes in the economy and social patterns also led to larger ranches utilizing this area primarily in the summer months compared to year-round homestead parcels.

The timbered lands surrounding Big Summit Prairie were first visited during the exploration and mining periods in the 1860s. Gold was discovered along nearby Ochoco Creek in the 1870s and travel route was established across the Ochoco Mountains to Canyon City. This is mapped as the Canyon City Wagon Road on early maps. Cinnabar was discovered near the turn of the century and the production of mercury flourished until the 1940s when market conditions and the economy changed.

Public domain lands and Forest Reserves were established in the early 1900s. Stock grazing was at its peak and the Forest Service mission was set up to manage grazing and settle range disputes. The mission included marking forest boundaries, coping with beetle infestations and establishing roads, trails, telephone lines and facilities like ranger stations and fire lookouts. Grazing allotments and stock driveways were soon established to better manage stock grazing. Logs were burned out to develop watering troughs for sheep, cattle and horses. Names and dates in many of the surviving aspen stands reflect herders moving stock across the forest. Magnetic telephone lines were soon constructed to provide better communication between local communities, ranger stations and fire lookout points. These administrative developments led the way to fire patrol, range management and access to the forest.

Management Direction

Management direction for cultural resources is found in the Ochoco National Forest Land and Resource Management Plan, in the Forest Service Manual section 2360, in Federal Regulations 36CR64 and 36CFR800 (amended December 2000), and in various federal laws including the National Historic Preservation Act (NHPA) of 1966 (as amended), the National Environmental Policy Act, and the National Forest Management Act.

In general, the existing management direction asks the Forest to consider the effects on cultural resources when considering projects that fall within the Forest's jurisdiction. Further direction indicates that the Forest would determine what cultural resources are present on the Forest, evaluate each resource for eligibility to the National Register of Historic Places (National Register), and protect or mitigate effects to resources that are eligible.

Additional surveys of potentially impacted areas would be done in accordance with the Ochoco Inventory Strategy.

Desired Condition

The desired condition is not clearly stated in the Forest Plan but can be derived from the implied goals of the Standards and Guideliness and the Monitoring Plan. It would be desired to know the location and extent of all cultural resources, to have evaluated each one for eligibility to the National Register, and to have developed management plans for all eligible properties that would provide protection or mitigate effects that may occur to the resources.

It is desired that the current trend of unmanaged recreation activities, such as those occurring on known sites, would in the future have such use directed to areas more appropriate and sustainable in consideration of cultural resources. Existing use patterns have likely affected historic

properties and individual site integrity. This project provides an opportunity to direct some of the motorized recreational use to areas away from historic sites and cultural resources.

Existing Condition

It is assumed there has been loss of site integrity from actions that occurred before the implementation of regulations for the National Historic Preservation Act (NHPA). This means that the active protection of cultural resources has a relatively short history, approximately 40 years. Historic use of places beginning in the historic period of discovery, settlement, and subsequent development of forest roads, trails, and other facilities that overlap known and unknown sites has likely caused loss of site integrity.

In addition to pre-field investigations utilizing Geographical Information System layers and existing records, site specific surveys have been conducted on seven percent of the entire analysis area. The area of potential effects (APE) occurs approximately 100 ft on each side of proposed trails and an area of up to 5 acres at each staging area. The majority of the high probability areas within the APE for the Preferred Alternative (Alternative 3) have been surveyed.

Numerous cultural resource sites are present in the project area. Many of these are linear features such as historic roads and trails, stock driveways and telephone lines. One of the historic linear sites, the Historic Summit Trail, has been evaluated and has been found to be eligible to the National Register of Historic Places (NRHP). A small percentage of the remaining linear features have been recommended for eligibility but have not been fully evaluated. Any on these sites that have been recommended for eligibility would have to be fully evaluated if they were to be found adversely affected by the proposed project. The remaining are prehistoric in age (inferred from the presence of stone tool technologies), or contain evidence of occupation during both time periods.

Sites from the historic period include the Historic Summit Trail, Cold Springs Guard Station, stock driveways and corrals, historic structure remains, utility corridors, fire lookouts, historic trails (many of which are now roads) and the remains of historic sheep camps. Prehistoric site types represented include lithic scatters, lithic scatters with flaked stone tools and sacred sites.

Spatial data review for all known sites in the APE indicated that the majority of the prehistoric sites are not located near any of the proposed routes of the designated trail system. Many of the remaining prehistoric and historic sites in the APE are crossed by or are situated on or adjacent to existing Maintenance Level 1 (closed roads) or Level 2 (roads for high clearance vehicles) that would become part of the designated trail system. Since an effort was made to locate proposed trails on existing disturbance such as roads or trails, some of the designated routes are on top of roads or trails that have been identified as historic sites. Of the sites that are crossed by proposed trail segments, each alternative is described based on the total number of sites crossed and the number of sites that are linear features such as roads, trails or telephone lines.

- Alternative 1 does not propose any designated trails and therefore does not add any designated routes or remove any unauthorized routes across cultural sites. The existing transportation system (roads and trails) would remain as currently in place regardless of the presence or absence of heritage sites.
- Alternative 2 (APE = 4,088 acres): Routes cross or closely approach a total of 26 recorded sites and one traditional food area. Of the recorded sites: four are linear features located on system roads; nine are sites alongside system roads where the proposed route is on the road prism, four are proposed route crossings on linear features that are not system roads; five can be mitigated by implementing minor rerouting to avoid sites; and four are on segments of FS road 2630 which would be mitigated by designing these segments in accordance to the Historic Summit Trail Management Plan. One site is

located at a viewpoint, where heritage values would be maintained by coordinating placement of the trail and any associated improvements with the District or Forest Archeologist, and the historic significance would be interpreted for the benefit of the public.

- Alternative 3 (APE = 2,432 acres): Routes cross or closely approach a total of 23 recorded sites and one traditional food area. Of the recorded sites: three are linear features located on system roads; six are sites alongside system roads where the proposed route is on the road prism, six are proposed route crossings on linear features that are not system roads; five can be mitigated by implementing minor rerouting to avoid sites; and two are on segments of FS road 2630 which would be mitigated by designing these segments in accordance to the Historic Summit Trail Management Plan.
- Alternative 4 (APE = 5,087 acres): Routes cross or closely approach a total of 39 recorded sites and one traditional food area. Of the recorded sites: five are linear features located on system roads; eleven are sites alongside system roads where the proposed route is on the road prism, ten are proposed route crossings on linear features that are not system roads; nine can be mitigated by implementing minor rerouting to avoid sites; and 4 are on segments of FS road 2630 which would be mitigated by designing these segments in accordance to the Historic Summit Trail Management Plan. One site is located at a viewpoint, where heritage values would be maintained by coordinating placement of the trail and any associated improvements with the District or Forest Archeologist, and the historic significance would be interpreted for the benefit of the public.

Historically significant structures exist in the analysis area at the Ochoco Ranger Station, Cold Springs Guard Station, and Salters Cabin. None of these structures are within the APE. Also included within the analysis area are the Blue Ridge, Mother Lode, Amity, Independent, Mayflower and Scissorsville mines. Some of these mines have associated structures. However, none of these mines are within the APE. The Summit Trail was found eligible for nomination to the National Register of Historic Places in 1987. Within the analysis area, the Summit Trail corridor includes approximately 3,036 acres allocated for partial visual retention, 2,780 acres allocated for visual retention and 86 acres allocated for preservation. Within all of these allocations the desired condition is to maintain the existing historic integrity of the Summit Trail and to enhance and interpret significant segment for public enjoyment and education (LRMP 4-61). The LRMP also states that pristine segments will be managed to protect, interpret and preserve their historic qualities.

Direct and Indirect Effects

Alternative 1

In general, this alternative would continue the existing situation of uncontrolled recreation and use of user-created trails through the forest until the Travel Management Rule is implemented. Where new routes are developed through cultural resource sites, there is displacement, crushing, breakage, and general loss of site context and integrity. Where OHV use persists on existing roads that traverse eligible or unevaluated cultural resource sites, integrity would continue to degrade as unrestricted travel allows vehicles to forge into new sites. Lack of maintenance on user-created trails can compound effects on eligible or unevaluated sites by development of deep ruts causing erosion plus breakage, displacement, and loss of artifacts and site integrity.

Action Alternatives

Following guidelines in a 2003 Regional Programmatic Agreement (PA) among USDA-Forest Service, the Advisory Council on Historic Preservation, and the Oregon State Historic

Preservation Office (SHPO), a finding of "No Adverse Effect" (No Historic Properties Affected) was determined under Stipulation III(B)5 of the Programmatic Agreement. The Forest finds that there are historic properties but the undertaking would have no effect on them as defined by 36 CFR 800.16(i). Any potential information that would otherwise be lost would be documented and reported to the SHPO. This finding is based on Project Design Elements and Mitigation Measures (see Chapter 2 of this document) that have been incorporated to determine the eligibility of unevaluated sites prior to trail construction. This would be accomplished through a series of treatment, data collection, and trail rehabilitation measures to document potential character defining features of the site. For those sites that may be eligible and are already being traversed from user-created trails through or adjacent to the site, Mitigation Measures would include site protection of the remaining portion adjacent to the route, data recovery, and/or avoidance. Protection is not required for those sites that are evaluated and found not eligible.

The Ochoco Land and Resource Management plan provides direction for the historic Summit Trail, which includes maintaining the existing historic integrity. Thus for the proposed trail segments along the Summit Trail further development, including construction, maintenance, signs, information boards, etc. should be consistent with the emphasis and desired conditions for the Historic Summit Trail (MA-F7, LRMP page 4-61 to 4-62).

A mitigation/site protection table is incorporated in the cultural resource compliance report. Because of its sensitive nature, it is not included here. Coordination between project implementation personnel and the District and/or Forest archaeologist(s) would occur during layout of the trails in the sensitive areas to best adjust designated routes, design mitigating structures or surfacing, or identify site boundaries where avoidance is required.

Trail construction may involve widening or narrowing of the trail clearance to the appropriate width for the class of vehicle to be used for the trail system. On some trails, this would be 50 inches for ATVs (class I), which also accommodates motorcycles. Other trails would be 24 inches to accommodate motorcycles (class III) only. Still other trails would be 80 inches wide for jeeps and buggies (class II), which would also accommodate class 1 and III vehicles. Also, routine ground disturbing activities would occur such as blading of trails for leveling and maintenance, as well as creating and maintaining appropriate drainage features and width limiting obstacles.

There are circumstances where past motorized access for dispersed recreation activities has occurred within known sites. It is unknown if these activities in the area have altered character defining site features and how much site integrity has been compromised. Where a user-created trail is proposed for the designated trail system and it overlaps a known site, rutting and periodic maintenance activities have the potential to bury, crush, displace and/or lose context for artifacts that may be within the footprint of the trail. Prior to trail construction and designation, all known sites would be mitigated or evaluated for eligibility to NRHP. If the site is found to be eligible, the next step would be to determine whether the portion that overlaps the trail would contribute to that eligibility. If it does, then the following may take place: 1) trail relocation; 2) data recovery efforts sufficient to recover available information and the trail system would continue to be used; and/or 3) site protection through tread armoring and/or barriers to off-trail travel.

Trail grooming equipment includes a narrow tracked machine with a blade mounted in the back. Such equipment might eventually expose otherwise unknown cultural material on an unidentified site by removing obscuring deposits. Due to the patchy distribution of ash and clay deposits in the project area, artifacts are likely to be near the surface on tight clay soils, while they may migrate up and down in the ash soil strata. Agents of movement are artificial, as noted above, as well as natural, such as wind and flood events, erosion, tree roots, tree tip ups, burrowing insects, rodents, birds, and especially freeze-thaw cycles. Where ash soils are present, artifacts are not always

visible on the surface and may be exposed following disturbance. Where clay soils are present and surface erosion has occurred, artifacts may be transported from their original location.

On proposed trail segments that are on top of existing roads, the trail would be built on ground that is already disturbed. In those instances when the road or existing trail traverses a known cultural resource site, loss of potential site information has been assumed to have already occurred within the depth of the road material and would not increase as a result of changing the use of the road. In some cases, the road would have shared use between regular (passenger cars, pickups, etc.) and trail vehicles. In others, the road would be closed to all but trail system users. Neither of these instances would directly affect a known site that is already traversed by the road. Design elements include the staying within the existing road prism when converting old roads into trails.

Another potential loss of site integrity would occur if an existing road is being converted to a narrower width for a trail segment. The method of ripping the road bed with heavy equipment, especially on a native surface, could directly affect a cultural resource site that may be traversed by the road. Although loss of integrity may have occurred during road formation and continued use, deposits below the surface of the road bed could disturb a buried archaeological site, its artifacts, and their context within the site. Project Design Features in this circumstance would maintain the integrity of the site by avoiding ripping of the soil on known cultural sites and using trail narrowing methods such as surface impediments in lieu of subsurface ripping during road-to-trail conversion.

Outside of known sites there is potential for disturbance to sites that are yet to be discovered. During ripping or cross drainage installation during conversion of old roads to trails, and during decommissioning of unwanted existing roads or user trails, additional sites may be exposed or disturbed. Monitoring and/or mitigation would be coordinated with the District or Forest archeologist for any newly discovered site. All rehabilitation ground disturbing activities would occur where there would be no effect to eligible historic properties or other known cultural sites. Other rehabilitation activities would use appropriate non-ground disturbing methods such as above ground barriers and shallow scarification and rooting of vegetation especially on native surface project locations.

There is a potential from the sound generated by OHVs to be heard where American Indians potentially hold ceremonies or harvest traditional cultural foods. There may be other unknown sites that would typically remain unidentified because of their sacred nature. The purpose of the sites is of religious importance and is meant to occur in the absence of artificial/outside intrusions. The sound from OHV engines, or other activities unrelated to OHV use could be considered such an intrusion. The Scoping Letter and maps were sent to representatives of Confederated Tribes of Warm Springs, Klamath Tribes, Burns Paiute Tribe and Confederated Tribes of Umatilla. Communication with these tribes will continue throughout the planning and Section 106 (cultural resource management) process. Any information on cultural resources or traditional cultural properties will be addressed following the Project Design Elements in Chapter 2 of this DEIS.

Cumulative Effects

Cumulative effects on cultural resources were determined by focusing on the current aggregate effects of past, present, and reasonably foreseeable future actions. For cultural resources, in general, past actions have avoided effects to eligible or unevaluated cultural resource sites, because of the Forest Service responsibility to protect their values. This has largely been accomplished through avoiding the pertinent cultural resource sites for those activities that are closely monitored. For example, overlapping vegetation management projects (Spears, Canyon, Ochoco Valley Fuels, Howard Elliot Johnson, Zane, Deep Restoration) determination of effect to

cultural resources found: "Following guidelines in a 2004 Regional Programmatic Agreement among USDA-Forest Service, the Advisory Council on Historic Preservation, and the Oregon State Historic Preservation Office, a finding of "No Historic Properties Adversely Affected" was determined.

In the past, the strategies of site protection or mitigation have been successful because of efforts to inventory, identify, evaluate, and manage cultural resources. Therefore, any overlapping past, present, or reasonably foreseeable action on this project would not result in cumulative effects.

Monitoring

Site monitoring would occur during any phase of soil disturbance when it overlaps a known site. Site monitoring would also occur when excavating for toilet vaults to examine buried deposits for potential artifacts and features that would indicate a buried site not previously identified.

Range Resources

Introduction

The Ochoco Summit Trail System project area is approximately 301,574 acres and is located on the Ochoco National Forest in Crook and Wheeler Counties. The project area has been grazed since the late 1800s and early 1900s by sheep, cattle, and horses with the main objective of providing forage for livestock. The project area is located within portions of twenty-eight allotments and a Wild Horse Management Area. Table 132 describes the 28 allotments adjacent to and intersecting the project area. Twenty-five of the allotments are active allotments, one of which is a sheep allotment. Remaining active allotments are currently grazed by cattle. The Little Summit Allotment is comprised of both private and National Forest System lands. The other allotments are composed solely of National Forest System lands. To facilitate the management of these allotments, water developments and fences have been constructed over the years. A majority of the water developments are associated with spring sources or stock ponds. Water developments benefit both wildlife and livestock.

For the purpose of discussing livestock grazing, all of the area located within the allotments will be included in discussion.

Table 132. Allotment Information.

Allotment	Total Acres	Acres In Project Area	Kind/Class	Permitted Number	Season of Use	AUMs
Antler	661	661	Cattle-cow/calf	114	06/16-09/30	537
Badger	29,942	29,942	Cattle-cow/calf	496	06/21-09/30	2,248
Bearskull/Cottonwood	43,226	6,365			Closed	0
Big Summit	24,750	24,750	Cattle-cow/calf	400	06/16-09/30	1,883
Brush Creek	10,521	10,521	Cattle-cow/calf	110	07/01-09/30	445
Buck	451	451	Cattle-cow/calf	16	07/11-09/25	54
Burn	4,671	3,174	Cattle-cow/calf	130	04/15-08/14	698
Crystal Springs	7,190	7,190	Cattle-cow/calf	185	05/17-08/31	871
Deep Creek	17,577	17,577	Cattle-	200	06/16-	929

Table 132. Allotment Information.

Allotment	Total Acres	Acres In Project Area	Kind/Class	Permitted Number	Season of Use	AUMs
			cow/calf		09/30	
Derr	12,474	12,474	Cattle-cow/calf	150	07/01-09/30	599
Elkhorn	15,020	15,020	Cattle-cow/calf	290	06-15-09/30	1,340
Fox Canyon	13,007	13,007	Cattle-cow/calf	217	06/15-09/30	1,031
Gray Prairie	10,935	10,935	Cattle-cow/calf	325	06/15-09/30	1,544
Happy	18,624	18,624	Cattle-cow/calf	230	06/21-09/30	1,018
Indian Creek	525	525	Cattle-cow/calf	30	07/15-09/30	103
Little Summit	15,704	15,704	Cattle-cow/calf	200	06/21-09/30	886
Lookout	2,625	2,345			Closed	0
Lost Horse	6,848	460	Cattle-cow/calf	100	06/16-09/30	471
Marks Creek	10,542	10,542	Cattle-cow/calf	366	07/01-09/30	1,449
North Fork	6,034	6,034	Cattle-cow/calf	150	06/15-09/30	713
Pisgah	5,079	5,079	Cattle-cow/calf	156	06/16-08/11	391
Prairie Parcels (Shady Cr.)	78	78	Cattle-cow/calf	22	05/01-06/15	45
Prairie Parcels (Brush)	353	353	Cattle-cow/calf	22	07/15-10/15	89
Pringle	7,203	21	Cattle-cow/calf	225	06/21-09/24	950
Reservoir	34,173	34,173	Sheep-ewe/lamb	2,200	06/16-09/30	2,354
Roba	18,266	18,266	Cattle-cow/calf	236	06/16-10/15	1,250
Rock Creek	6,428	6,428			Vacant	0
Snowshoe	2,710	2,710	Cattle-cow/calf	156	08/12-09/30	343
Wolf Creek	42,231	23,901	Cattle-cow/calf	781	06/16-10/15	4,135

Information for pasture turn on dates, turn off dates and numbers were taken from the Grazing Permits at Lookout Mountain Ranger District and Paulina Ranger District.

Cattle Allotments

All cattle allotments in the project area range in size from one pasture to eight pastures. Most allotments containing more than one pasture are on a deferred rotation grazing system. Grazing season varies from April 15th to October 15th. A combination of cow/calf pairs, yearlings, and bulls graze the landscape, within an authorized Animal Unit Months (AUMs) stocking limit per allotment.

Sheep Allotment- Reservoir

The Reservoir allotment is not split into pastures, but is managed by the trailing of two bands of sheep. The permit authorizes 2,200 ewe/lamb pairs from June 16th through September 30th, for a total of 2,354 AUMs. There are two bands of sheep (each 1,100 pairs) that trail through the allotment, the Canyon Creek Band and the Reservoir Band. Herders are with the sheep for the entire grazing season. Sheep are permitted to water and bed at specifically authorized locations only once per season. Actual turn-out dates and permitted numbers have been consistent with the permit. Range readiness criteria have always been met prior to turn-out (2210 Range File, Reservoir Allotment, Inspection Notes).

Wild Horses

The Wild Horse Management Area falls within the same area as the Reservoir allotment and is managed for 55 to 65 animals.

A wild horse is any untamed horse that resides in or has temporarily strayed from a recognized Wild Horse Territory. In 1975 a Wild Horse Management Plan and Environmental Assessment was developed for the Ochoco National Forest. The objective is “to provide protection, management and control of wild, free roaming horses in order that we might perpetuate a sound biological unit consistent with the Wild Free Roaming Horse and Burro Act of 1971” (2260 Range File, Ochoco Wild Horse Management). The plan states that the wild horse herd should be managed for 55 to 65 animals. If population numbers rise above 65 animals, methods of capture and control are utilized to keep a stable population. The Wild Horse Herd Management Area does not fall within the Burn and Crystal Springs Allotments; however, wild horses are commonly found in both. Wild horses have often resided in Hohn Springs pasture of the Burn Allotment and in the Coyle Creek pasture of the Crystal Springs Allotment.

There are several factors that possibly contribute to the migration of wild horses out of the Herd Management Area (HMA). Key factors are fence maintenance (particularly winter damage to fences), lack of winter range and off-road vehicles. Wild horses have been able to move out of the HMA by the means of damaged fence. Currently the HMA does not contain enough winter range to accommodate the herd and horses naturally move to lower elevations where winter forage is more accessible. These areas are typically outside of the HMA. There is some speculation that horses may also be moving to escape harassment from off-road vehicles, which are commonly used within the HMA.

Information on wild horse data was taken from the Wild Horse File for the Herd Management Area, which is located on the Lookout Mountain Ranger District, Ochoco National Forest.

Range Improvements - Cattle and Sheep Allotments

Throughout the project area there are several range improvements including fences and water developments and exclosures. All range improvements help in keeping livestock distributed throughout the allotment. Permittees are responsible for pasture fenceline, allotment boundary fenceline and water developments. Permittees maintain these fences prior to turn-out every year. Most exclosure maintenance is the responsibility of the Forest Service. Several water developments have been recorded as needing maintenance or relocation.

Environmental Effects

Under any alternative, livestock grazing would continue to occur within the Ochoco Summit Trail System project area. Current stocking rates and management practices would remain the same. Wild horse occupancy would continue to occur within the analysis area, and management would target a population size of 55 to 65 horses.

Alternative 1

Under this alternative there would be no dedicated trail system for off-road motorized recreation. Current management plans would guide management of the project area, and OHV use off of designated roads and trails would be expected to decline with implementation of the Travel Management Plan (2011).

Range vegetation trend and livestock distribution would not be altered by trail development or use. Range improvements including troughs, ponds, exclosures and pasture fences would remain at the current level of risk of damage by people. Likelihood for livestock-OHV interactions would not be changed from what is expected to occur under implementation of the current Travel Management Plan. Additional cattle guards would not be needed.

Effects Common to all Action Alternatives

Under these alternatives a system of trails and areas would be designated by class of vehicle and season of use. Trails would be designated in 15 active allotments. Rehabilitation or restoration activities would take place in previously damaged areas and interconnecting unauthorized or user-created routes to promote recovery, and to prevent confusion about which routes are open and which are not. Non-motorized use would not be prohibited on proposed motorized trails.

Alternatives 2, 3 and 4 would decrease available forage for livestock. The implementation of new routes would remove suitable range, which can be a source of forage (see Table 133 and Table 134 for Loss of Forage in Acres). Livestock may be displaced during high use times on the trail system and distribution throughout the project area could also be negatively affected with the increase of OHV use in a localized area. If livestock distribution is negatively impacted, localized areas in uplands and riparian areas may receive greater grazing utilization. The proximity of the trail to several livestock water developments may cause livestock to avoid those areas when approached by OHV users, making those developments ineffective. This would change the distribution of livestock and utilization patterns, which would lead to a need for additional monitoring of livestock and potentially require a change in existing Allotment Management Plans (AMPs). Trail system routes would not go through the Wild Horse Herd Management Area (HMA), resulting in no decrease of available forage in the HMA for wild horses.

Range improvements such as troughs, fences, water tanks, and cattle guards not only help manage livestock, but wildlife as well. Table 135 identifies range improvements that are adjacent to or intersecting a proposed trail segment under each alternative. A major concern with increased use on the trail system adjacent to range improvements is vandalism or user group conflicts. Improvements are used to disperse domestic livestock throughout the allotment. All action alternatives include design elements intended to avoid or reduce the likelihood of damage to improvements. Livestock may avoid trail users entirely, or be harassed by OHVs, which could potentially lead to the destruction of fences or injury to livestock.

Direct and indirect effects to grazing operations should be minimal. Permittees that operate in the project area should continue to be able to access range improvements for maintenance, spread salt, and check the herd for distribution. By restricting travel to designated routes only, permittees may have an increase in labor under this alternative due to the need to pack salt and access improvement by foot or horseback. Permitted off road travel to access range improvements may be administratively authorized under the Term Grazing Permit, but would have to be planned in advance and authorized by a Line Officer.

Direct and indirect effects under action alternatives may affect the introduction and spread of noxious weeds. The type of activity, intensity and location of associated disturbance, and proximity to a seed source will affect the probability or risk of introducing noxious weeds or contributing to their spread. Potential for noxious weed infestations due to cross-country travel

across the analysis area will decrease with vehicle access restricted to designated areas. However, there will continue to be unauthorized use, which can potentially create in an increase in the spread of noxious weeds in rangelands if vehicles are not clean. The increase in weed infestations can decrease native vegetation, which provides forage for livestock. As noted in the Invasive Plant section, all action alternatives could result in an increase of noxious weeds and other invasive plants across the project area. Overall overlap of proposed routes within noxious weed locations is low. There are up to three weed infestations crossed by proposed trails, and up to 5 gathering areas within or adjacent to weed sites (varies between alternatives). Weed sites within the concentrated use areas (staging, etc) have the most potential for spread of weeds. Refer to Table 128 in the Botany section for further details on weed sites intersected by proposed routes or areas.

Mitigations that Address Livestock Safety/Harassment Effects are as follows:

- Place cattle guards in place of gates where OHV trails cross existing pasture fences.
- Increase distance of trail from water developments if trail is within 100 ft. of development. This will reduce the potential of collisions between livestock and off-road vehicles and the potential of vandalism to water developments and livestock.
- Provide education literature about livestock management at staging areas.
- If rangeland conditions change due to OHV pressure on livestock movement, DMAs (designated monitoring areas) should be moved to more representative areas if needed.

OHV use for maintaining grazing allotment improvements off the trail system will be by prior authorization as part of AOI (Annual Operating Instructions). This will be reviewed by the Line Officer.

Table 133. Loss of Suitable Rangeland on New Routes (Acres of Forage lost by Alternative).

	Alternative 2			**Alternative 3**			**Alternative 4**		
Vehicle Class	I	II	III	I	II	III	I	II	III
Miles of New Routes	31	12	26	22	0	28	48	11	22
Acres of Suitable Range Lost	15.7	9.7	6.3	11.1	0	6.8	24.2	8.9	5.3
Total Acres	**15.7**	**9.7**	**6.3**	**11.1**	**0**	**6.8**	**24.2**	**8.9**	**5.3**
Total	**31.7**			**17.9**			**38.4**		

Table 134. Loss of Suitable Rangeland on New Routes for Forage by Alternative & Allotment.

		Alternative 2			Alternative 3			Alternative 4		
	Vehicle Class	I	II	III	I	II	III	I	II	III
Badger Allotment	Miles of New Routes	5.45	7.06	0	0	0	2.51	6.62	7	0
	Acres of Suitable Range Lost	2.75	5.7	0	0	0	.61	3.34	5.66	0
	Total Ac. Lost	**8.45**			**.61**			**9**		
Big Summit Allotment	Miles of New Routes	.17	5	.06	0	0	.48	.17	4.24	0
	Acres of Suitable Range Lost	.09	4.04	.01	0	0	.12	.09	3.43	0
	Total Ac. Lost	**4.14**			**.12**			**3.52**		
Crystal Springs Allotment	Miles of New Routes	1.23	0	0	3.05	0	0	3.9	0	0
	Acres of Suitable Range Lost	.62	0	0	1.54	0	0	1.97	0	0
	Total Ac. Lost	**.62**			**1.54**			**1.97**		
Deep Creek Allotment	Miles of New Routes	6.5	0	5.78	0	0	11.17	8.54	0	5.06
	Acres of Suitable Range Lost	3.28	0	1.40	0	0	2.71	4.31	0	1.23
	Total Ac. Lost	**4.68**			**2.71**			**5.54**		
Derr Allotment	Miles of New Routes	0	0	1.17	0	0	.45	0	0	2.94
	Acres of Suitable Range Lost	0	0	.28	0	0	.11	0	0	.71
	Total Ac. Lost	**.28**			**.11**			**.71**		
Elkhorn Allotment	Miles of New Routes	1.79	0	3.1	2.64	0	0	6.07	0	0
	Acres of Suitable Range Lost	.90	0	.75	1.33	0	0	3.07	0	0
	Total Ac. Lost	**1.65**			**1.33**			**3.07**		
Happy Allotment	Miles of New Routes	4.46	.32	1.55	0	0	1.99	6.41	0	0
	Acres of Suitable Range Lost	2.25	.26	.38	0	0	.48	3.24	0	0
	Total Ac. Lost	**2.89**			**.48**			**3.24**		

Table 134. Loss of Suitable Rangeland on New Routes for Forage by Alternative & Allotment.

		Alternative 2			Alternative 3			Alternative 4		
	Vehicle Class	I	II	III	I	II	III	I	II	III
Little Summit Allotment	Miles of New Routes	0	0	5.4	0	0	5.4	1.09	0	6.56
	Acres of Suitable Range Lost	0	0	1.31	0	0	1.31	.55	0	1.59
	Total Ac. Lost	**1.31**			**1.31**			**2.14**		
Marks Creek Allotment	Miles of New Routes	1.27	0	0	4.11	0	0	5.49	0	0
	Acres of Suitable Range Lost	.64	0	0	2.08	0	0	2.77	0	0
	Total Ac. Lost	**.64**			**2.08**			**2.77**		
Pisgah Allotment	Miles of New Routes	2.05	0	2.09	2.41	0	0	3.56	0	0
	Acres of Suitable Range Lost	1.04	0	.51	1.22	0	0	1.8	0	0
	Total Ac. Lost	**1.55**			**1.22**			**1.8**		
Reservoir Allotment	Miles of New Routes	6.74	0	.12	7.33	0	0	6.87	0	0
	Acres of Suitable Range Lost	3.4	0	.03	3.7	0	0	3.47	0	0
	Total Ac. Lost	**3.43**			**3.7**			**3.47**		
Roba Allotment	Miles of New Routes	0	0	.65	0	0	.65	0	0	.65
	Acres of Suitable Range Lost	0	0	.16	0	0	.16	0	0	.16
	Total Ac. Lost	**.16**			**.16**			**.16**		
Rock Creek Alltoment	Miles of New Routes	0	0	.39	0	0	.39	0	0	.87
	Acres of Suitable Range Lost	0	0	.09	0	0	.09	0	0	.21
	Total Ac. Lost	**.09**			**.09**			**.21**		
Snowshoe Allotment	Miles of New Routes	1.24	0	0	1.24	0	0	1.24	0	0
	Acres of Suitable Range Lost	.63	0	0	.63	0	0	.63	0	0
	Total Ac. Lost	**.63**			**.63**			**.63**		

Table 134. Loss of Suitable Rangeland on New Routes for Forage by Alternative & Allotment.

		Alternative 2			Alternative 3			Alternative 4		
	Vehicle Class	I	II	III	I	II	III	I	II	III
Wolf Creek Allotment	Miles of New Routes	0	0	5.35	0	0	5.35	0	0	6.06
	Acres of Suitable Range Lost	0	0	1.3	0	0	1.3	0	0	1.47
	Total Ac. Lost	**1.3**			**1.3**			**1.47**		

Table 135. Range Improvements in the Ochoco Summit Trail System Project Area that are Adjacent to or Intersect Proposed Trail Segments.

Improvements	No Action	Proposed Action	Alternative 3	Alternative 4
Troughs or Ponds	0	23	24	39
Fence Crossings/Adjacencies	0	58	50	81
Corrals	0	2	1	2
Cattle guards	0	Est. 50	Est. 50	Est. 65

- Troughs indicated are at least within ¼ mile of trail.
- Fences indicated include fence crossings and/or fence-lines that run adjacent to trail.
- New cattle guards for trail crossings through range fences would require excavation in the road prism for installation.

Cumulative Effects

Cumulative effects result from the potential effects of an increase in recreational use by OHVs on designated routes in the Ochoco Summit project area combined with the effects of past, present or ongoing activities. For Alternatives 2, 3, and 4: The proximity of trail users to existing water developments may be expected to cause avoidance of these areas by livestock. Combining OHV use and livestock grazing on allotments may lead to increased livestock use in areas that are generally utilized less or not at all. Travel patterns of cattle may be altered and new cattle trails may be created, which may lead to new areas of soil compaction. Vegetation and forage species composition can be expected to change over time in response to changes in livestock distribution. This effect may be off-set to some degree in areas where implementation of the Travel Management Rule limits motorized access, thereby reducing effects of human interaction with livestock in areas not associated with designated routes.

Past road construction and maintenance, grazing, timber harvest and other soil disturbance have provided environments for noxious weed species establishment. Past activities within the analysis area have resulted in moderate amounts of weed infestations occupying 2,090 acres. The potential for noxious weed establishment and spread from passenger vehicles not associated with the project alternatives along open road corridors (including seasonally open roads) would continue. The potential for other vectors of spread within the project area including people, wind, or animals would also continue.

In addition to the past and current activities within the project area, adding 88 to 158 miles of designated OHV trail on routes that are not otherwise open to motorized travel could result in cumulative impacts to forage production due to establishment or spread of invasive plants. At the same time, implementation of the Travel Management Rule, prohibits overland use of OHVs and all motorized travel on routes that are not designated as open, which would reduce the risk of introducing invasive plants into areas not associated with designated trails.

The Ochoco/Deschutes NFs Invasive Plant Treatment Record of Decision has been recently signed. This decision increases the ability to effectively control invasive plants with herbicides.

The ability to use herbicides will increase efficiency, thus lowering costs, which results in the ability to treat more acres for the same costs. This proposal does not synergistically interact with the proposed trail system, but does help reduce the extent and duration of effects of noxious weeds on native vegetation.

Wilderness, Inventoried Roadless and Unroaded Areas

Within the area planned for motorized routes or areas, there are no Inventoried Roadless Areas (IRA) or Wilderness Areas as defined by Forest Service Manual 7712.16a "Contiguous Unroaded Areas." However the Lookout Mountain Recreation Area (an IRA), the Rock Creek/Cottonwood Creek Area, the Bridge Creek Wilderness and the USFS-managed portion of the North Fork Crooked River Wilderness Study Area are within the project area boundary. High quality or undisturbed soil, water and air quality are values often used to characterize inventoried roadless areas. Activities proposed by this project do not overlap any IRA; therefore effects to soil, water and air quality are as disclosed in those sections of the EIS. Management emphasis for Lookout Mountain Recreation Area includes opportunities for high quality semiprimitive recreational activity and wildlife habitat. Potential impacts to these resources are disclosed in the Recreation and Wildlife sections of this EIS. There would be no effect from any of the action alternatives on any area within the Lookout Mountain Recreation Area. The closest proposed motorized trails are > 4 miles from the boundary of this area. OHV use would be allowed on any road open to non-highway legal vehicles that are within or adjacent to the Recreation area. There are 1.3 miles of road currently open to non-highway legal OHV use adjacent to or within the Lookout Mountain Recreation Area.

Management emphasis for the Bridge Creek Wilderness is to maintain a natural setting and preserve solitude. Effects to this resource are discussed in the Recreation section of this EIS. Bridge Creek Wilderness would not be affected by the action because the closest point to any proposed motorized OHV trail is over one mile. No portion of the wilderness area is within the noiseband >45 db.

Rock Creek/Cottonwood Creek Area is an unroaded area with a management emphasis on protecting soil, water and fisheries while providing opportunities for nonmotorized recreational use. Activities proposed by this project do not overlap unroaded areas and therefore do not affect unroaded characteristics within the project area. Potential impacts to nonmotorized recreation and to Keeton Trail based on areas where sounds may be heard at greater than 45db when OHVs are riding on the designated OHV trail system are discussed in the Recreation Section. There are 50 miles of trails managed exclusively for non-motorized use within the project area, but none of the trails are within the > 45db noiseband (except for a maximum of 0.03 miles of Keeton Trail).

The management emphasis in The North Fork Crooked River Wilderness Study Area (WSA) as discussed in the LRMP is to maintain existing conditions of the area for potential wilderness designation or until released from further consideration. The North Fork Crooked River WSA was evaluated and recommended as n0n-suitable for Wilderness designation by the Prineville District BLM in the mid-1980s. This recommendation was approved by the BLM Oregon State Office, the Secretary of the Interior and the President of the United States. The final status of the SWA is to be determined by Congressional legislation. In the meantime it is being managed for its wilderness potential under Interim Management Policy (BLM Manual H-8550-1) and by guidance under the North Fork Crooked River Management Plan (USDI/USDA 1993). As noted in the Recreation section no trails or areas are proposed within the North Fork Crooked River Wild and Scenic River Corridor and no portion of the corridor is within the noiseband for >45db.

Visual Quality

The existing scenery has a variety of disturbed and undisturbed areas. Human-caused activities and natural disturbances have altered the appearance of the landscape. Diverse vegetative composition and structure across the project area provide textural and color patterns that vary seasonally. Depth-of-field views vary between restricted to immediate foreground in high density stands, to filtered middleground views in moderate density to open timbered stands, to wide-open spaces offering long distance background views (vistas). This project would have a very limited amount of clearing of vegetation. Clearing would be the minimum width necessary to meet trail clearing standards along proposed routes, and clearing at staging areas or trail heads would be focused on safety and providing adequate room for turning-around, parking and in some cases campsites. Impacts to vegetative scenery would be evident, but would be of a relatively small scale in comparison to more expansive activities associated with vegetation and fuel management projects that have occurred, are being planned, or are ongoing within the project area.

There are specific Project Design Criteria (PDC) listed in Chapter 2 for visual emphasis areas including the Historic Summit Trail and visual corridors. Visually attractive areas such as aspen stands, cottonwood groves, meadows, seeps and springs would also be avoided during trail lay-out and construction as described in the PDC. The trail designs and sign plan would be developed that consider Forest Plan Visual Quality Objectives. However, directional and traffic management signs would be installed at trail system intersections, at trail crossings over open roads, and at Staging areas and/or Trail Heads. These signs may be considered to be an impact to the natural appearance of the sites where these signs are installed. However, they would be comparable to other signs that are already present across the project area for traffic control, recreation sites, trail markers and visitor information. Where rehabilitation or concealment of unwanted routes is proposed, these sites should improve in natural appearance compared to their current condition once vegetation becomes established.

Air Quality

Affected Environment

The 1970 Federal Clean Air Act, as amended in 1977 and 1990 (42 U.S.C. §7401 et seq.), is a legal mandate designed to protect human health and welfare. National Ambient Air Quality Standards are defined in the Clean Air Act as levels of “criteria” pollutants above which may result in detrimental effects on human health and welfare. These criteria pollutants include carbon monoxide, lead, nitrogen oxides, particulate matter ($PM_{2.5}$ and PM_{10}), ozone, and sulfur dioxide.

State Implementation Plans (SIPs) are adopted by each state to implement the provisions of the Clean Air Act. State Implementation Plans describe the state’s actions to achieve and maintain National Ambient Air Quality Standards. Oregon Department of Environmental Quality is responsible for assuring compliance with the Clean Air Act. In 1994, the Forest Service, in cooperation with Oregon Department of Forestry and the Bureau of Land Management signed a Memorandum of Understanding (MOU) to establish a framework for implementing an air quality program in Northeast Oregon. However the MOU is specific to smoke management associated with prescribed fire. Implementation of this project is not expected to alter smoke emissions from prescribed fire and would thus not affect compliance with the MOU.

Section 160 of the Federal Clean Air Act also requires measures to “preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other places of specific national or regional natural, scenic, or historic values.” Class I airsheds include Forest Service and Fish and Wildlife Service Wilderness areas over 5,000 acres that were in existence before August 1977, and National Parks in excess of 6,000 acres as of

August 1977. Designation of Class I airsheds allows only very small increments of new pollution above existing air pollution levels, Class I airsheds have high air quality protection standards, in part, because visibility was identified as an important value. The nearest Class 1 Wilderness Airshed is The Strawberry Mountain Wilderness. Due to the location of the project area, prevailing winds and low volume of emissions anticipated from construction, use and maintenance of this OHV trail system, this project is not likely to affect any Class I Airshed.

Class 2 airshed is an airshed classification representing National Forest System Land that is not within a Class I airshed. The Ochoco Summit project area is a Class 2 airshed. Class 2 airsheds may receive a greater amount of human-caused pollution than Class I airsheds. These areas include areas that are neither industrialized nor meet the specific requirements for classification as Class I areas. They are protected by the Prevention of Significant Deterioration (PSD) program. The Prevention of Significant Deterioration (PSD) permitting program is a Clean Air Act permitting program for new and modified major sources of air pollution such as power plants, manufacturing facilities, and other facilities that emit air pollution.

Background

The U.S. Environmental Protection Agency (EPA) set national air quality standards for six common pollutants (also referred to as "criteria" pollutants. These standards are known as National Ambient Air Quality Standards (NAAQS) and are listed at the following web site: http://www.deq.state.or.us/aq/planning/. PSD applies to all pollutants that do not exceed the National Ambient Air Quality Standards (NAAQS) in an area. PSD also applies to other pollutants that do not have a NAAQS. These non-criteria pollutants are listed in EPA's regulations. Maintenance Areas are those geographic areas that had a history of nonattainment, while Nonattainment Areas have not consistently met the clean air levels set by the U.S. Environmental Protection Agency in the National Ambient Air Quality Standards (NAAQS). There are no mapped Air Quality Maintenance or Non-attainment Areas in Crook, Wheeler or Grant Counties (Oregon DEQ 2009). The Oregon Smoke Management Report displays principal population centers that are smoke sensitive receptors. The cities of Bend, Redmond and John Day are the closest municipalities shown as smoke sensitive areas on the Oregon Smoke Management Plan map which can be viewed at the following web site: http://www.oregon.gov/odf/pages/fire/smp/smkmgtannualrpts.aspx. The City of Bend was previously classified as a “Designated Area” in an Oregon Smoke Management Report as potentially air quality impaired. The City of Prineville, which is closest to the project area, is not shown as smoke sensitive on the Smoke Management Plan map, but is tracked by DEQ with an Air Quality Index. The Air Quality Index (AQI) is a color-coded tool which shows air pollution levels. The AQI for particulate matter (both $PM_{2.5}$ and PM_{10}) is based on the average of the previous 24 hours of pollution levels and is coded as good, moderate and two classes of unhealthy.

Fugitive Dust

“Fugitive dust” is the term used when the soil crust is disturbed or broken and soil particles are released and raised into the air by air currents generated by vehicles (Ouren et al. 2007).

Soil disturbance and migration are items to be considered in any setting where motor vehicle travel is off hardened surface roads. These soil particles, created when the crust is disturbed, are considered particulate matter. Particulate matter is a mixture of small liquid droplets and microscopic solid particles that can be formed or emitted directly into the air (including dust, dirt, smoke and soot) The haze associated with air pollution is caused when these tiny particles scatter or absorb visible light (McCarthy et al. 2006; EPA 2010). The EPA (2009) defines the following sizes of particulate matter:

- Ultrafine particles generally defined as those less than 0.1 microns.
- $PM_{2.5}$, also known as fine fraction particles (generally defined as those particles with an aerodynamic diameter of 2.5 microns or less) usually 1/30th the diameter of a hair.
- PM_{10} (generally defined as all particles equal to and less than 10 microns in aerodynamic diameter; particles larger than this are not generally deposited in the lung).

The Clean Air Act directs the EPA to set standards for particulate matter in the form of primary and secondary standards. Primary standards set limits on the amount and size of particulate matter that could be injurious to human health, while secondary standards set public welfare limits (damage to crops, animals, visibility impairment). These pollutants and standards are displayed in Table 136.

McCarthy et al. (2006) describe the dust plume raised by passing vehicles as PM_{10} whereas the emissions created by engine combustion are usually $PM_{2.5}$. The smaller size of the $PM_{2.5}$ particles allows for easy ingestion into human lungs and has been linked to health issues, such as asthma and strokes (EPA 2003). Road surface type, speed, and vehicle type all play a part in how much dust is created (Goossens and Buck 2009).

Consistent dispersal patterns indicate that larger particles travel shorter distances and stay relatively close to the ground while smaller particles go higher into the air and travel further away from the source (Padgett 2006). Wind direction, velocity, and canopy cover are factors in dust dispersal patterns and distance. Riders may not ride at mid-day on hot summer days due to the hot, dry and dusty conditions. Optimum riding is typically in the slightly cooler morning and evening periods during mid to late summer and during the moister and cooler spring, early summer and fall months.

In one study, the more open the trail terrain with adequate air circulation the faster the dust particles dispersed, and conversely, if the riding area was under heavy canopy with poor air circulation dust particles hang in the air for longer amounts of time (Meadows et al. 2008). In the Ochoco Mountains air circulation is also effected by time of day, with afternoon and evening breeze common during the summer use period.

Emissions

Vehicle emissions, particularly those resulting from two-stroke engines (nitrogen oxides, sulfur dioxide, carbon monoxide, ozone, aldehydes, and extremely persistent polycyclic aromatic hydrocarbons) and lightweight soil particles or “dust” resulting from vehicle travel on unpaved surfaces (also known as fugitive dust) can contribute to localized air quality degradation, even though National Ambient Air Quality Standards in a larger area are being met (Ouren et al. 2007).

Emissions from OHVs, particularly two-stroke engines (engines that use a gas and oil mixture in the combustion chamber), can contribute to decreased air quality because two-stroke engines do not completely burn fuels resulting in increased emissions containing nitrogen oxides (NO_x), sulfur dioxide (SO_x), carbon monoxide (CO) and ozone (O_3). Research has shown that a small two-stroke engine (e.g. chainsaw, which is considerably smaller than a standard two-stroke OHV engine) running for two hours emits the same amount of hydrocarbons as driving 10 fuel-efficient cars for 250 miles each (http://www/arb/ca/gov/msprog/offroad/sm_en_fs.pdf). Pollutants emitted from exhaust can create varying impacts on vegetation.

The U.S. Environmental Protection Agency (EPA), as directed by the Clean Air Act, set national air quality standards for six common pollutants, also referred to as “criteria pollutants.” These pollutants, carbon monoxide (CO), lead (Pb), nitrogen dioxide (N_2), Ozone (O_3), particulate matter (PM), and sulfur dioxide (SO_2), can damage crops, reduce visibility, combine with other pollutants to form wet and dry acids (acid rain), and prevent heat from escaping into space. This

latter effect contributes to the increasing concentrations of greenhouse gases that are considered responsible for climate change. Weather plays a part in the formation of some pollutants like ozone. Hotter, drier weather means higher ozone levels (EPA 2008), but the reduction of nitrogen oxide (NO_x) emissions reduces ozone levels.

Table 136 shows the criteria pollutants and their current allowable limits. These limits have been reviewed by the EPA to determine if the levels set in the 1990s are still appropriate or if more stringent measures are needed to reduce the potential impacts on greenhouse gases and human health. Previously, just registered vehicle engines (passenger cars and trucks) were tested and had exhaust emissions criteria set. Historically nonroad engines (recreational vehicles, diesel marine engines, and snowmobiles, etc.) were not required to have emissions standards. The EPA started implementing emissions standard requirements for these type engines (off-highway motorcycles and ATVs) in 2006, with 100 percent phase-in in 2007 (see 40CFR 1051). As new engines are designed to meet these criteria, older and less clean OHVs would be gradually phased out.

Table 136. Pollutants and standards.

Pollutant	Average Time	National Ambient Air Quality Standard (NAAQS) Violation Determination[1]	Federal Primary Health Standard (NAAQS) Exceedance Level	State Standard Exceedance Level
Carbon monoxide	1-hour	Not to be exceeded more than once/year	35 ppm	35 ppm
	8-hour	Not to be exceeded more than once/year	9 ppm	9 ppm
Lead	Calendar Quarter	Quarterly arithmetic mean	0.15 µg/m^3	0.15 µg/m^3
Nitrogen dioxide	Annual	Annual arithmetic mean	53 ppb	53 ppb
	1-hour	3-year average of the maximum daily 98th percentile one hour average	100 ppb	NA
Ozone	8-hour	3-year average of the annual 4th highest daily maximum 8-hour average concentration	75 ppb	75 ppb
$PM_{2.5}$	24 hour	98th percentile of the 24-hour values determined for each year. 3-year average of the 98th percentile values.	35 µg/m^3	35 µg/m^3
	Annual Average	3-year average of the annual arithmetic mean	15 µg/m^3	15 µg/m^3
PM_{10}	24 hour	The expected number of days per calendar year with a 24-hour average concentration above 150 µg/m^3 is equal to or less than 1 over a 3-year period.	150 µg/m^3	150 µg/m^3
Sulfur dioxide	1 hour	3-year average of the maximum daily 99th percentile one hour average	75 ppb	NA
Units of measure are parts per million (ppm), parts per billion (ppb) or micrograms per cubic meter of air (µg/m^3). For more information about the standards, visit http://www.epa.gov/air/criteria.html (EPA 2011).				

Direct and Indirect Effects

Alternative 1

Under the No Action Alternative, fugitive dust is present and a result of cross-country travel along user-created trails and existing motorized travel on established roads. With implementation of the Travel Management Rule motorized travel on designated routes the dust would be localized close to the open unpaved roads within the analysis area. Motor vehicle travel on unpaved or

native surface roads would produce dust but most would settle back out quickly and close to the trail. Some of the lighter particles would travel higher in the air and farther from the trail, but given the open nature of the trail design and air circulation, these would settle out in relatively short distances.

Alternatives 2, 3, and 4

The action alternatives affect where motorized vehicles can be legally operated on National Forest lands, and thus could potentially affect the location and concentration of vehicle emissions and fugitive dust resulting from vehicle travel on non-paved surfaces. There may be some increased temporary localized air quality impairment from vehicle emissions and fugitive dust in areas where a high level of OHV use occurs. This increased effect on air quality is assumed to be minimal, except in localized areas, because none of the alternatives are likely to change the overall amount of motorized use across the Forest. Vehicle travel on unpaved surfaces in areas prone to dust will continue to occur on the system of native and aggregate surface open roads, with larger vehicles and at speeds much higher than what is anticipated to occur on the proposed OHV trails, and when dusty conditions are likely. Thus there would be an increase in fugitive dust in close proximity to the proposed trail network, but it would be relatively small in comparison to the effect of ongoing travel across the project area.

The alternatives could also indirectly affect the location of unplanned human-caused wildfire starts, which could then have an indirect effect on air quality. It is possible that fire starts could occur as a result of OHV equipment or associated human use along the trail system. Since under Alternatives 2 through 4 would designate a motorized trail system fire risk associated with use of the trail system would be more readily monitored and restricted as necessary during extreme fire conditions. This could lead to reduced ignitions, more rapid detection and suppression, thereby potentially reducing emissions. However, these effects on air quality from human-caused wildfire that could be attributed to fire starts from OHVs or other uses within the designated trail system are highly speculative and are therefore not measurable. The potential for any of the alternatives to affect air quality indirectly as related to wildfires is predicted to be negligible and is therefore not discussed in further detail in this analysis.

In Alternatives 2 and 4 the areas with trail segments and supporting areas at or near the Ahalt Mineral Source, Peterson Lava, Ross/Peterson Ridge, Road 600 and Happy Camp would have increased levels of dust and emissions at those locations compared to the other alternatives. Alternative 2 and 4 include a class II network that would be largely utilized by vehicles that run 4-cycle engines and that travel the trail at very low speeds. These factors would combine to produce less of the pollutants associated with 2-cycle engines as well as fugitive dust. On the other hand the trails would be slightly wider and thus could be exposed to slightly higher levels of wind erosion, except where the trails are on lava or constructed boulder trails which are resistant to wind erosion. Alternatives 3 and 4 have more concentrated loops at the west end of the proposed system and thus, the opportunity for riders to encounter fugitive dust and associated dust particles with potential to affect human health would be greater in that area, as well as compared to the other alternatives. Although riders tend to utilize the trail systems during the seasons when dust can be avoided[5], the potential for exposure to dust is the greatest during the core summer season.

For all alternatives there may be some localized temporary air quality impairments from vehicle emissions and areas prone to dust. This would be particularly evident in staging areas where engines are started and warming up and where warm up loops and youth riding areas are provided. However, from an airshed perspective, the Ochoco Summit OHV area is far from the

[5] 2009, communication with Vicki Ramming, COHVOPS Program Director

nearest area designated as potentially air quality impaired (Bend, Oregon), as well as from the nearest non-attainment and maintenance areas (Klamath Falls, Lakeview). And the DEQ smoke sensitive communities (Bend, Redmond and John Day). Any localized impairment would be diluted to a scale that would be impractical to measure and negligible at the scale of airsheds. A projected 2 to 5 percent yearly increase in riders would not change this condition.

Cumulative Effects

For all of the alternatives, smoke and smoke drift from prescribed maintenance burns would have the potential to impact the Ochoco Summit OHV area. There is the potential for portions of the trail system to be closed on burn days due to reduced visibility from smoke and any possible health concerns. The prevailing winds are out of the southwest and normally would push the smoke east away from the proposed OHV area. The alternatives would have no direct or indirect effect on smoke emissions from Forest management activities, which are managed by the Oregon Department of Forestry as delegated by the Oregon Department of Environmental Quality.

Implementation of the Travel Management Rule across the Forest would reduce fugitive dust by restricting motorized cross county travel. Ongoing forest thinning projects in the project area could potentially reduce the time the dust is in the air by opening stands, thus allowing for increased air circulation and settling the dust more quickly. Fugitive dust and its effects would remain localized and would not change the disclosures for human health or water quality.

Potential cumulative effects include the vegetation and fuels management program that overlaps the project area, with a foreseeable action of up to 20,000 acres of prescribed fire across the analysis area (Spears, Canyon, HEJ, Zane, Jackson). Although it is acknowledged that prescribed burning releases common criteria pollutants, such as CO, the overlap of effects cannot be expressed as an aggregate. Smoke from prescribed fire contains much more particulate matter and travels a greater distance, and dispersion is highly dependent on prevailing winds, terrain and weather conditions. Effects to air quality from OHV use of a trail system tends be localized, with dispersion in proximity to the trail network and staging areas, rather than moving at landscape scales across airsheds.

Social and Economic Analysis

Social and economic elements, which are interrelated and interdependent with ecological elements, comprise the human components of the ecosystem. The implications of resource management decisions for the Ochoco Summit OHV project to the social and economic values are of interest to the residents, business owners, and users of the area. For the purposes of describing socio-economic effects on the economy, this analysis focuses on the economy of central and southeastern Oregon. The effects to the local economies are based on the estimated number of jobs created. The bulk of the area and communities potentially influenced by actions on the Ochoco National Forest lie within Deschutes, Crook, and Jefferson, the southern most part of Wheeler, eastern most part of Grant, and the northern most sections of Harney and Lake counties. This is referred to as the Zone of Influence

General Information and Population Estimates

The following information was retrieved from the Oregon State Archives website[6] and from reports generated in October, 2012, from the “Economic Profile System-Human Dimensions Toolkit” (see project file, Ochoco National Forest, Prineville, Oregon, for the complete reports). Population estimates discussed in the following text are summarized in Table 137.

[6] http://arcweb.sos.state.or.us/pages/records/local/county/histories.html

Crook County

Crook County was established on October 24, 1882. It was created from the southern part of Wasco County and named after U.S. Army Major-General George Crook, a hero of the Snake Indian Wars.

Crook County is situated in the geographic center of Oregon. It has been reduced from its original size of 8,600 square miles to 2,991 square miles by the creation of Jefferson County in 1914 and Deschutes County in 1916. The current boundaries were established in 1927. Crook County is bounded by Jefferson and Wheeler Counties to the north, Grant and Harney Counties to the east, and Deschutes County to the south and west.

In 1882 the Legislative Assembly established Prineville as the county seat. The voters confirmed the choice of Prineville, the only incorporated town in the county, in the 1884 general election. Prineville was named in honor of the town's first merchant, Barney Prine.

The first census in 1890 showed a population of 3,244 excluding the Indians. The last several censuses have shown an increase in inhabitants with the 2010 population of 21,515 representing a 12.2% increase from 2000. The fast pace of growth in the nearby Bend-Redmond area has played a role in the rising population of Crook County.

While the economy of the county historically was based on agriculture and forestry, currently manufacturing, retail trade, and education, health care and social assistance support the greatest number of jobs in Crook County.

Deschutes County

Deschutes County was created from the western portion of Crook County on December 13, 1916. The county encompasses 3,055 square miles and is located in the central portion of the state. Geographically, the county includes portions of the Cascade Mountains and the central high desert plateau. It is bounded by Jefferson County to the north, Crook County to the east, Klamath and Lake Counties to the south, and Lane and Linn counties to the west. The county seat is located in the city of Bend which was incorporated in 1905.

Principal industries in the county are tourism, timber, and agriculture, chiefly cattle and potatoes. The destination resort, Inn of the Seventh Mountain, and the resort communities of Black Butte and Sunriver, were developed during the 1970s. The Mount Bachelor ski area and High Desert Museum add to the tourism-based economy in the county as well. Numerous golf courses have been added in recent years.

The first county census was taken in 1920 and counted a population of 9,622. The 2010 population of 154,568 represented an increase of 34.0% over 2000.

Grant County

Grant County was established on October 14, 1864, and named for General Ulysses S. Grant, commander of the Union Army during the Civil War. Earlier in his military career Grant had been stationed at Fort Vancouver and assigned to protect the increasing number of emigrants traveling the Oregon Trail. Grant County is located in eastern Oregon and was created out of Wasco and Umatilla Counties. At that time Grant County was the largest county in the state. Its size was later reduced by the transfer of land to Lake County and the creation of Harney and Wheeler Counties. Grant County shares boundaries with eight counties: Morrow, Umatilla, and Union to the north; Harney to the south; Malheur and Baker to the east; and Crook and Wheeler to the west. It has an area of 4,528 square miles.

Grant County contains the headwaters of the John Day River, which has more miles of wild and scenic designation than any other river in the United States. More than sixty percent of the

county's land area is under public ownership, and the county contains parts of four national forests. Principal industries are agriculture, livestock, forestry, and recreation.

The first census was taken in 1870 and counted 2,251 persons. The population of Grant County in 2010 was 7,349. This represented a 7.4% decrease from 2000.

Harney County

Harney County was created from the southern two-thirds of Grant County on February 25, 1889. It is located in the high desert country in the southeast portion of the state and is the largest county in Oregon, comprising 10,228 square miles. Counties with contiguous borders include Malheur to the east; Lake, Deschutes, and Crook to the west; Grant to the north; and the State of Nevada to the south. The county was named after the lake that lies within its territory, which was named in honor of General William S. Harney, commander of the Department of Oregon of the U.S. Army in 1858-1859.

Harney County's population is primarily concentrated in a small urbanized sector of Burns-Hines with the remainder mostly in the Harney Basin. The county's population was recorded as 2,559 during the 1890 census and rose steadily until the decade of 1930-40, and then resumed an upward curve until the 1980s. The county experienced a net out migration of nearly fifteen percent in the 1980s primarily due to the closure of the lumber mill in Burns. The 2010 population of 7,364 represented a 3.2% decrease from 2000.

Jefferson County

Jefferson County was created on December 12, 1914, out of territory that was once part of Crook County. The county was named after Mount Jefferson, the second highest peak in Oregon with an elevation of 10,497 feet, which marks the county's western skyline. The county is bounded on the north by Wasco County, on the east by Wheeler and Crook Counties, on the south by Deschutes County, and on the west by Linn and Marion Counties. The county encompasses 1791 square miles.

The county's population at its first federal census in 1920 was 3,211. The 2010 population of 21,652 represented a 13.9% increase from 2000.

Lake County

Lake County was established on October 24, 1874. It was created from the southern part of Wasco County and the eastern part of Jackson County. It was named because of the numerous large lakes that are entirely or partly within its borders.

Lake County is situated in south central Oregon. The western boundary was changed with the creation of Klamath County in 1882. It regained some area when the southwestern part of Grant County was annexed in 1885. It currently has 8,275 square miles. Lake County is bounded on the north by Deschutes County, on the east by Harney County, on the south by the State of California, and on the west by Klamath County.

The 1875 Lake County census showed a population of 944, which jumped to 2,804 by 1880. Since then there has been some fluctuation in population, but with a fairly steady growth to a population of 7,882 in 2010. This represented a 6.2% increase over the 2000 population.

Wheeler County

Wheeler County was established on February 17, 1899. Formed from parts of Grant, Gilliam, and Crook Counties, there have been no boundary changes since its creation. The county shares boundaries with Gilliam and Morrow Counties to the north, Wasco and Jefferson to the west, Crook to the south, and Grant to the east. The county was named for Henry Wheeler, who

operated the first stage line through the county. The area of the county is 1,713 square miles, and the county seat is located in the city of Fossil.

Wheeler County's 2010 population was 1,443. This represented a decrease of 6.7% from 2000.

Table 137. Population data in the seven Zone of Influence counties for the Ochoco Summit OHV Trails project.

County	Population		Change	Percent Change
	2000 Census Data	2010 Estimate		
Crook	19,182	21,515	2,333	12.2
Deschutes	115,367	154,568	39,201	34.0
Grant	7,935	7,349	-568	-7.4
Harney	7,609	7,364	-245	-3.2
Jefferson	19,009	21,652	2,643	13.9
Lake	7,422	7,882	460	6.2
Wheeler	1,547	1,443	-104	-6.7
Total	**178,071**	**221,773**	**43,702**	**24.5**
Information obtained from reports generated in October, 2012, from the "Economic Profile System-Human Dimensions Toolkit."				

Future population projections are expected to mimic that of the past decade. Deschutes, Crook, and Jefferson Counties are expected to continue with growth, whereas the more rural counties, Wheeler, Grant, Harney, and Lake are projected to grow quite slowly, if at all.

Employment

Table 138 summarizes the changes in the civilian labor force in Central Oregon over the last decade.

Table 138. Changes in civilian labor force in the Zone of Influence for the Ochoco Summit OHV Trail System project.

County	Civilian Labor Force		Change	Percent Change
	2000 Census Data	2010		
Crook	8,764	9,252	488	5.5
Deschutes	58,836	72,837	14,001	23.8
Grant	3,792	3,135	-657	-17.3
Harney	3,765	3,313	-452	-12.0
Jefferson	8,918	8,571	-347	-3.9
Lake	3,371	3,373	2	0
Wheeler	662	614	-48	-7.2
Total	88,108	103,105	14,997	17.0
Information obtained from reports generated in October, 2012, from the "Economic Profile System-Human Dimensions Toolkit."				

The following information comes from a report generated by the "Economic Profile System-Human Dimensions Toolkit" in October, 2012. In Crook County, the three largest sectors were education, health care and social assistance, (1,494), manufacturing (1,400), and retail trade (1,355). In Deschutes County the three largest sectors were education, health care, and social assistance (13,364), retail trade (9,219) and construction (8,539). In Grant County the three largest sectors were education, health care and social assistance (695), agriculture, forestry, fishing, hunting, and mining (469), and retail trade (294). In Harney County, education, health care and social assistance was tied with agriculture, forestry, fishing, hunting and mining for largest sector (618), followed by arts, entertainment, recreation, accommodation, and food (430) and retail trade (363). In Jefferson County the three largest sectors were education, health care and social assistance (1,629), manufacturing (1,552), and retail trade (989). In Lake County the

three largest sectors were agriculture, forestry, fishing, hunting and mining (710), education, health care and social assistance (520), and retail trade (376). In Wheeler County the three largest sectors were arts, entertainment, recreation, accommodation, and food (163), agriculture, forestry, fishing, hunting and mining (110), and education, health care and social assistance (107). Overall, the number of jobs in most sectors has declined in recent years; in Deschutes County, however, jobs increased in all sectors.

As of August, 2012, the unemployment rate in Oregon as a whole was 8.2 percent; while unemployment rates in the individual counties were[7]:

- Crook, 12.9 percent;
- Deschutes, 10.4 percent;
- Grant, 10.6 percent;
- Harney, 10.9 percent;
- Jefferson, 11.2 percent;
- Lake, 10.7 percent; and
- Wheeler, 7.1 percent.

Population Characteristics of OHV Users

This section briefly describes the population characteristics of OHV users in the Pacific Region (Oregon, Washington, and California), Oregon, and the local Central Oregon area; the information is based on the 2008 report "Off-Highway Recreation in the United States and its Regions and States: An Updated National Report," which was produced by the National Survey on Recreation and Environment, Internet Research Information Series.

Population Characteristics of OHV Users in the Pacific Region

In the Pacific Region (Washington, Oregon, and California), the rate of OHV participation (18.7 percent) is nearly the same as the national rate. The 6.9 million OHV users living in the Pacific region are about 16 percent of the national total. Similar to other regions, participation declines with age. People under age 30 are about three times more likely to participate as those over 50. Males are also significantly more likely to be OHV users than females. American Indians have the highest participation rate (31 percent) among racial and ethnic groups, just as they do in every other region. Though the Hispanic rate (14 percent) is next to the lowest, the number of Pacific Hispanic OHV users (about 1.3 million) is second only to Whites. This is due to the large Hispanic population, especially in California.

People with family incomes over $50,000 all participated at similar rates (23 to 27 percent). Only 12 percent of the lowest income class participated. Similar to every other region, the highest educated strata participated at the lowest rates. Just 13 percent of people with post-graduate degrees were OHV users compared with 21 percent of high school graduates and those attending some college or technical school. Also similar to every other region, the participation rate for non-metropolitan residents (32 percent) was much higher than for metro-area dwellers (18 percent), however, since the population in the Pacific region is more than 90 percent metropolitan, this population group dominated the OHV users, accounting for about 89 percent of the 6.9 million participants.

Population Characteristics of OHV Users in Oregon

The data show that Oregon has a slightly higher percentage of OHV users than the Pacific region as a whole. The 2004 Oregon Statewide Motorized Trail User Survey was conducted over a four-

[7] Retrieved on October 9, 2012, from http://www.qualityinfo.org/pubs/rolf/12/rolf-0912.pdf.

month period from January to April 2004 by the University of Oregon's Survey Research Laboratory. The survey found that seven percent of Oregon households have a person reporting motorized trail use, amounting to 98,000 households in the state. ATV riding is the most popular activity, with 70 percent of motorized trail users having engaged in that activity during the past year followed by off-road motorcycling (44 percent). Most motorized respondents were male, and the median age was 40 – 49 years old. More than half had some college (62 percent), although most were not college graduates (21 percent). Median income was $40,000 to $69,999.

Population Characteristics of OHV Users in Central Oregon

Based on the initial data of the Central Oregon Off-Highway Vehicle Use Study conducted by Virginia State University during 2008, 77 percent of the visitors are returning users to Central Oregon OHV trails. Seventy percent of the visits are overnight use and average a three day trip. Thirty percent make day use trips averaging a six hour day. In a typical year, 12 days were spent recreating in Central Oregon, 24 days at other OHV areas. The average miles from the primary residence to this area was 129 miles.

The composition of the various groups visiting the area was 42 percent friends, 30 percent family and friends, 24 percent family, three percent single and 1½ percent organized club or organization. Forty one percent of the visitors were 31-40 years old.

A 2006 study (Outdoor Industry Foundation) estimated that 72 percent of Americans aged 16 and older participated in an outdoor activity in 2005, with hiking, running and bicycling on trails being three of the most frequently reported activities. Non-motorized recreation continues to be one of the most popular categories of recreation throughout the state and within the local region. National Visitor Use Monitoring (NVUM) findings show that most visitors participate in non-motorized activities (English et al., 2003). A description of visitor activities was compiled from the survey. Visitor's top picks while visiting the Ochoco National Forest were viewing wildlife, natural features and scenery; primitive camping; fishing, hunting, and developed camping. Each visitor also picked one of these activities as their primary activity for the current recreation visit to the Forest; the top primary activities on the Ochoco were developed camping, viewing wildlife/nature, hunting, horseback riding, and general relaxing. Dispersed camping and day use picnicking on the Ochoco account for about 27 percent of visitors' primary or secondary activities.

National Visitor Use Monitoring data indicate that big game hunting is a popular activity on the Ochoco National Forest, which is a regionally and even nationally popular destination for big game hunting. Approximately 22.6 percent of visitors identified hunting as either a primary or secondary activity on the Ochoco. Hunting was also in the top five most popular activities for visitors to the Ochoco.

Although many of these activities are often classified as "non-motorized," the lines between motorized and non-motorized uses begin to blur for many of these activities. For instance, viewing natural features and hunting can be motorized or non-motorized activities. Primitive camping could be considered by some to be any camp outside of developed campgrounds that they may have accessed with motorized vehicles for generations, while other visitors taking the survey might consider primitive camping to be a campsite in a remote Wilderness area only accessible after many hours of hiking. Available survey data do not make any distinction for whether motorized use is associated with these activities, although there are data regarding OHV use specifically as both a primary and secondary activity.

Off-Highway Vehicle Uses

National Visitor Use Monitoring (NVUM) findings indicate that the Ochoco was not a major provider of OHV (Off-Highway Vehicle) recreation in the year surveyed. Nationally, about 2.5 percent of the 205 million annual recreation visits to National Forests identified OHV use as their primary activity, with a slightly higher percentage (3.1 percent) as a secondary activity. Data for the Ochoco National Forest indicate a secondary use of 3.1 percent. For the Ochoco National Forest, the survey found that there were no recreation visits that year that were primarily for OHV use; the Ochoco ranks in the bottom three out of twenty administrative units in the Pacific Northwest Region of the Forest Service (R6) for primary OHV uses.

A somewhat larger percentage of visitors indicated that they participated in OHV recreation even if it was not their primary reason for visiting the Forest. For the Ochoco National Forest, the total percentage of visitors that reported OHV use as a primary or secondary activity was 3.35 percent of all the visits, or roughly 19,900 visits. These data are considerably below the average percent participation for Oregon overall (22.2 percent participation) as reported in the National Survey on Recreation and the Environment (Cordell et al., 2008). Considering both primary and secondary percentages, the Deschutes ranks slightly lower than middle, while the Ochoco ranks near the middle.

These data do not necessarily reflect the apparent local and regional demand for motorized trail systems in the area. Central Oregon is a regional destination for OHV trails, with many hundreds of miles of trails that can be used throughout the year. Based on the initial data of the Central Oregon Off-Highway Vehicle Use Study conducted by Virginia State University during 2008, East Fort Rock is the most used area for OHV recreational purposes; second is Millican Valley.

Cost Estimates

As constructions costs can vary significantly, only rough cost estimates can be used to demonstrate the economic range between the alternatives. With each of the proposed trail systems, there will be rutting, surface concerns, design needs for steep slopes and stream adjacency design concerns which would add to the construction cost. As a way to compare the construction of the new routes proposed for each alternative, the following rough cost estimates, based on ground slope, were developed. Estimates were based on the use of a Sweco trail building machine, a generic mini-excavator, operators, several laborers and saws for clearing and construction of the Class I and Class 3 trails. These values are only for analysis purposes to show the economic comparison of the alternatives. The estimates were broken into three slope ranges and do not include design, layout, signage or any sort of special constructed features or techniques:

0 - 15% Ground slope: $1,760/Mile

16 - 25% Ground slope: $2,840/Mile

26% + Ground slope: $4,340/Mile.

For this project, the slope breaks in the slope erosion map are 0-20%, 21-35%, 36-50% and greater than 51%. Table 139 reflects a summary of the new routes length (miles) for each alternative, broken out by slope. In order to use the cost per mile, 0-20% equates to the 0-15% value, 21-35% = 16-25%, >36% = 26%+. It was recognized that the flatter slope cost of $1,760/mile might be low for the 20% slope but this is a very rough estimate. For the purposes of this analysis, a rough estimate at $45,000 for each fiberglass bridge is assumed. The price for culverts might range from $10,000 - $20,000. For comparison purposes, the estimated costs for each alternative displayed in Table 139.

These estimates do not include design, contract development, installation nor construction inspection costs. An estimate for the boardwalks or fords was not developed. These costs also do not reflect development of the proposed staging areas, play areas, parking area or trail heads.

Alternative 2

In Alternative 2, for the majority of the new route construction, the slopes range from 0-20%. Cost for construction of new routes will vary by the slopes they cross. Based on cost estimates, the rough cost for actual construction of the new segments would run around $166,500, and bridges would cost $720,000, not including design costs.

Alternative 3

In Alternative 3, for the majority of the new route construction, the slopes range from 0-20%. Cost for construction of new routes will vary by the slopes they cross. Based on cost estimates, the rough cost for actual construction of the new segments would run around $101,960, and bridges would cost $630,000, not including design costs.

Alternative 4

In Alternative 4, for the majority of the new route construction, the slopes range from 0-20%. Cost for construction of new routes will vary by the slopes they cross. Based on cost estimates, the rough cost for actual construction of the new segments would run around $194,800, and bridges would cost $765,000.

Table 139. Comparative costs per alternative based on new route length, ground slope and proposed culverts and bridges.

	Alternative 2	Alternative 3	Alternative 4
Class 1 (ATV)	31.06 miles/$62,627	21.92 miles/$47,991	51.09 miles/$105,029
Class 2 (Jeep)	12.39 miles/$53,772		11.24 miles/$48,797
Class 3 (Motorcycle)	25.67 miles/$50,027	28.40 miles/$53,971	22.14 miles/$40,937
Trail Cost Estimate	$166,500	$101,961	$194,762
Culverts	92 cmps at $92,000	27 cmps at $27,000	111 cmps at $111,000
Bridges	16 at $720,000	14 at $630,000	17 at $765,000
Total Cost Estimate	**$978,500**	**$759,000**	**$1,071,000**

Civil Rights and Environmental Justice

Civil Rights legislations, especially the Civil Rights Act (CR) of 1964, Title VI, prohibit discrimination in Forest Service program delivery. The underlying principal behind the Civil Rights Act is that no activity shall negatively affect minorities, woman, or persons with disabilities by virtue of their race, color, sex, national origin, religion, age, disability, or material or familial status.

Environmental Justice, Executive Order 12898, demands the fair treatment and meaningful involvement of all people. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from the execution of our actions. Environmental Justice focuses on minority, low income groups, and subsistence lifestyles (including Native American Tribes). The purpose of involving these groups and analyzing the effects upon them is to determine whether

adverse civil rights impacts are anticipated, or whether disparate or disproportionate impacts associated with the alternatives is anticipated on any of these groups.

With this project, there is no known potential for disparate or disproportionate effects, or to discriminate against or negatively impact any individual or subset of the population described above.

The reinforcement of existing road closures, given the nature of the project area and its extensive system of open roads, would not impede access throughout the project area. The actions proposed under Alternative 2, 3 and 4 would not have any measurable impacts on Tribal rights (ceded lands) or Tribal traditional uses. The project is not located in a minority community nor would it affect residents of low or moderate income. Potential impacts would not affect any specific subset of the American population at a disproportionately higher rate than others.

The effects of this project on the social and economic context of these groups are within those described in the Forest Plan. The benefits and risks associated with implementation of the proposed action are provided to all members of the public. Therefore, the project would not pose disproportionately high or adverse effects to minority communities or to low income groups. As a result, no formal Civil Rights Impact or Environmental Justice Analysis was undertaken.

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). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

The action alternatives propose development and designation of a trail system for motorized recreation. Much of the proposed trail in each alternative is located on existing disturbance; however, there would be some degree of new trail construction associated with each alternative. Once completed, the trail system would be expected to exist as a long-term recreation opportunity.

Recent trends of uncontrolled motorized recreation may not be sustainable over the long term. Proposed alternatives are intended to move conditions toward a balance of managed motorized recreation and sustainable vegetative, soil and watershed conditions. Soil and Water are two key factors in ecosystem productivity and protection of these resources is provided by the design criteria discussed in Chapter 2. Sustainable wildlife habitat, water quality and other resources depend on maintaining the long-term soil productivity upon which vegetation relies. No long-term effects to water resources are anticipated as a result of developing and designating a motorized trail system. All alternatives provide fish and wildlife habitat at levels necessary to maintain viable populations of the species within the project area.

Unavoidable Adverse Effects

NEPA requires disclosure of "… any adverse environmental effects which cannot be avoided should the project be implemented…" (40 CFR 1502.16).

All of the alternatives considered result in some adverse effects. Many of these adverse effects would be minimized through implementation of design criteria and resource protection measures

identified in Chapter 2 or through mitigation measures. Even with implementing these measures, there would still be adverse effects that cannot be avoided.

Soils

Additional detrimental soil conditions are expected as a result of implementing Alterative 2, 3 or 4. The use of ground-based trail construction equipment would result in additional compaction and displacement. Use of OHV equipment and traffic by other users would keep the surface of the designated trail in a disturbed condition. Implementation of the design criteria and monitoring described in Chapter 2 would minimize these adverse effects. Proposed season of use is limited in order to reduce impacts to soils. The alternatives were designed to limit the amount of detrimental soil conditions consistent with R6 Supplement 2500-98-1 (Regional Guidelines), effective August 24, 1998 by focusing proposed trail location on existing disturbance where it is available. New trail construction is proposed on segments needed to connect between segments that are on existing disturbance.

Staging area and/or trail head construction would also result in adverse effects on soils. Parking area and road construction results in soil compaction and displacement. Development of campsites, toilets, picnic areas and signboards can also result in soil displacement, compaction and impacts to of vegetative cover. On closed and decommissioned roads and user created trails where reinforcement of existing closures, rehabilitation and/or concealment are proposed, the soil surface can be revegetated, but soil productivity may remain reduced due to compaction. See the Soils section for more details on potential impacts to soil resources.

Invasive Plants

The potential for introduction and spread of invasive plants exists under every alternative considered, including no action. A risk assessment concluded that the potential for introducing and spreading invasive plants cannot be completely avoided. All action alternatives create conditions that are conducive to the introduction and spread of invasive plants. Use of OHV equipment and traffic by other users would keep the designated trail surface in a non-vegetated condition, which would be vulnerable to introduction and spread of invasive plants. Implementation of design criteria and monitoring as described in Chapter 2 would minimize these adverse effects.

Proposed activities such as trail, staging area or trailhead construction, campsite and picnic area development, and reinforcement of closures on unwanted routes could result in conditions conducive to the introduction and spread of invasive plants. Under proposed action alternatives invasive plant spread would be monitored and new sites would be proposed for treatment with an early detection rapid response strategy under the 2012 Invasive Plant Treatments EIS. See the Botany section for more details on potential impacts from invasive plant species.

Sedimentation/Turbidity

All action alternatives propose new OHV routes, staging areas or trailheads, and public use areas such as campsites and picnic areas. Use of OHV equipment and traffic by other users would keep the designated trail surface in a non-vegetated condition and would be a potential source of sediment. Most sediment delivered to streams would come from stream crossings, trail drainage close to streams and closure and rehabilitation of unwanted routes adjacent to Class IV streams and in ephemeral draws. Implementation of design criteria and monitoring as described in Chapter 2 would minimize these adverse effects.

Proposed activities such as trail, staging area or trailhead construction, campsite and picnic area development, and decommissioning of unwanted routes could result in conditions conducive to the release of sediment. Proposed season of use for OHVs on the trail system is limited in order to

reduce potential for sediment release and transport. See the Hydrology section for more details on potential impacts to water quality.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost 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 rights-of-way or road.

Irreversible commitments: Where over-sized materials (boulders) are removed from mineral sources and installed within the proposed trail network, they would be irreversibly committed to use for the purpose of development of this project, and they would no longer be available for other projects or for blasting and crushing to produce other aggregate materials such as riprap or gravel. Uses for such rock materials under this project would be as barriers to prevent travel on unwanted routes, width controlling devices to ensure trail use by appropriate vehicle class, obstacles to promote slow speed and improve technical challenge, constructed boulder crawls, trail surface hardening at selected locations, or as devices for defining campsites. Removing aggregate (gravel) from mineral material sources would result in an irreversible commitment of resources. Once aggregate is removed from material source sites and used in development of the proposed trail system, it cannot be renewed except over long periods of time. Use of materials such as gravel and riprap would occur at selected sites for the following purposes: selected hardening of the trail surface, construction of armored dips and fords, hardening of trailer parking areas or camp site parking, construction of bridge approaches, installation of culverts, installation of vault toilets, and hardening of areas with high foot traffic such as walkways at signboards, restrooms, and picnic sites.

Irretrievable commitments: Alternatives 2, 3 and 4 propose trail construction and development of supporting areas and facilities. Construction of trails and stream crossings is an irreversible action as it involves construction of features in portions of the landscape where they do not currently exist. This results in forgone opportunities to provide primitive access to the specific locations where the features are constructed and during the time in which the features are in use, and a commitment of land to a non-vegetative state (on trail surfaces and at staging areas, parking areas and campsites) until such time that the trail system is abandoned and the disturbed sites returned back to productive capacity. Though some of these trails and facilities are already in place, some of them would be changes from the existing condition and would thus represent an irretrievable commitment of the sites to use under a designated OHV trail system during the proposed season of use. The areas and routes would be available to other uses year round, but the time that they would not be utilized by OHVs would be limited to the season when use by OHVs is prohibited. Refer to Chapter 2 for proposed season of use under each of the action alternatives.

The action alternatives would designate some mineral material sources as staging areas and/or play areas, but some of these areas have already been committed to extractive use (rock material source) by past actions. Some of these mineral material sources are no longer in use for extraction. Refer to the Geology section for more details on mineral material sources. In some cases, such as with Six Corners, the area proposed for development of the staging area is separate from the area currently in use for mineral material extraction. In the active material sources, use of the area is primarily for mineral material sources, and motorized used proposed by this project is secondary. Thus, when extraction is occurring at a specific proposed staging area, the portions of that staging area needed for extraction, processing, loading and hauling would be closed to OHV use during the active period.

Incomplete and Unavailable Information

The Council on Environmental Quality's implementing regulations for NEPA require that an agency disclose information that is incomplete or unavailable when analyzing effects of activities in an environmental impact statement (40 CFR 1502.22).

Current estimates of OHV users are reliable using anecdotal data from riders, and from agency and law enforcement personnel. Assumptions on number of riders over time on the Ochoco Summit trail system is based on the number of riders using the area now, State of Oregon data, and anecdotal information from a similar designated trail system on the Willamette National Forest.

What is unknown is how implementation of the Travel Management Rule will affect local and regional OHV use, and in particular, if local use will be reduced or will become concentrated into the smaller areas where such use will be permitted. Under the previous travel plan Ochoco National Forest was open to cross-country travel unless designated closed. This may have attracted riders from other areas. It is unknown whether implementation of the Travel Management Rule across all Forests in the Region will alter the destinations to which OHV users travel or the distribution of OHV use across the areas where OHV opportunities are being developed across the region.

Motorized recreation opportunities, uses and trends in the Ochoco Summit trail system project area that have been summarized and disclosed in this EIS provide sufficient information about both motorized and non-motorized future uses for the decision-maker to reasonably distinguish between the alternatives.

Energy Requirements

Motorized recreation in particular, as well as recreation in general, results in the consumption of energy. For environmental impact statements, NEPA requires a discussion of the energy requirements and conservation potential of proposed alternatives and mitigation measures [40 CFR 1502.18(e)].

Many people travel in and through the Ochoco National Forest every year, to access recreation opportunities, commute and/or work, transport goods and livestock, or on their way to other destinations. Almost all visitors to Ochoco National Forest utilize some type of motorized vehicle to access the Forest. While there is no quantifiable estimate, motor vehicle use in and through the Forest is increasing, and therefore associated energy use is also increasing.

Energy-consuming activities associated with recreation use in the Ochoco Summit OHV Trail project area include motor vehicle use to transport OHVs to staging areas, use of power generators at camp sites, driving for pleasure on Forest roads, and use of OHVs themselves on and off trail systems. Additional energy-consuming activities associated with any of the action alternatives would include use of vehicles, on and off-road, to transport Forest workers, volunteers and law enforcement officers, and motorized equipment used for trail construction, development of staging areas, installation of sign boards, and reinforcement of existing closures at crossings with unauthorized and unwanted routes.

The action alternatives include designating a trail system on which OHVs may be used in an area where they were previously permitted to be driven cross-country, and are currently allowed to drive on 659 miles of mixed use roads. This change is unlikely to affect the energy consumption within the project area. There are no irregular energy requirements involved in implementation of any action alternatives.

Implementation of the Travel Management Rule prohibits motorized recreation from occurring anywhere but on designated routes. This may displace some motorized recreation to other areas, and may focus use onto existing mixed use roads and trails, as well as onto any trail system implemented through the action alternatives analyzed in this EIS. The effects on energy consumption from these possible changes in use patterns are not expected to be measurable.

Effects on Laws, Regulations, Plans, Policies, and Procedures

The National Environmental Policy Act at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders." This section includes a brief summary of those laws, policies, and executive orders that are relevant to the proposed actions considered in this EIS.

Part 212-Travel Management

Subpart A- Administration of the Forest Transportation System

212.5(b) Identification of the Road System

The responsible official has identified the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest Lands. The interdiscplinary team and responsible official assessed roads within the project area on a route-by-route basis. A roads analysis for the Ochoco Summit OHV project area was compiled, utilizing information from other projects that overlap the analysis area to the extent there were available, and then completing the roads analysis process for potentially affected watersheds for which a roads analysis was not available. Through an interdisciplinary process, a minimum system was identified that meets applicable statutory and regulatory requirements and reflects long-term funding expectations. This system was analyzed at the appropriate scale and is reflected in the identified routes and road closure reinforcement sites proposed in each alternative. An appropriate discussion for each resource identifies the potential adverse and beneficial environmental effects associated each road segment and overall recommendations for route designation, closure, decommissioning or maintenance are included in the roads analysis.

Subpart B- Designation of Roads, Trails, and Areas for Motor Vehicle Use

212.55 (a) and (b)Criteria for Designation of Roads, Trails and Areas

(1)Damage to soil, watershed, vegetation, and other forest resources

Chapter 3 of this document displays the effects in detail to specific resources. In summary:

Soil: Activities associated with route designation (including new trail construction) and staging areas will have an effect on the soil resource by focusing soil disturbance on a designated network that will be designed, constructed, monitored and maintained in accordance to project design criteria intended to minimize adverse effects. This will cause negative effects at the location where new trails are constructed. However, the trail design also places the trail in more ecologically suitable locations and closes unauthorized and unwanted routes that intersect the designated system, allowing natural and management-induced processes to lower the overall footprint of detrimental soil conditions across the project area. Additional detrimental soil conditions as a result of creation of new trails is limited in scope from 50-81 miles dependent upon the alternative selected. The remainder of the routes is on existing disturbance so that utilizing them as trails would not result in additional disturbance. In some cases the width of area impacted by detrimental soil conditions may be reduced in the long-run where existing

compacted roads are converted to narrower trails. All alternatives have potential impacts to soil resources which are described in detail in the Soils section of this EIS.

Watershed: Key Issue #3 specifically responds to the designation of a motorized trail system that could potentially impact water quality and fish habitat. In response to this key issue Alternative 3 was developed. The overall design of the trail system is to pull motorized access away from aquatic resources compared to the existing pattern of disturbance and unauthorized routes that often run parallel to streams or through sensitive riparian areas. All action alternatives would reinforce closures of unauthorized routes that intersect the trail system. Where these unauthorized routes impact riparian areas, action alternatives may facilitate improvement of impacted areas compared to the existing condition. However, all alternatives have potential negative impacts to water resources which are described in detail in the Hydrology section of this EIS.

Vegetation: The Botany section of this EIS discloses the effects of development and use of an OHV trail system on rare plants, invasive plants (weeds) and special plant habitats. The analysis concluded the trail system and reinforcement of road closures may have a negative effect to rare and sensitive vegetation and to the risk of introduction and spread of invasive plants in the project area. In addition, action alternatives would potentially increase costs of future timber management in some circumstances because of the possible need to reuse road beds that get closure reinforcement or road-to-trail conversion. Since the majority of the area where the designated trails system is proposed has been recently managed for vegetation and fuels (Spears, Canyon, HEJ, Zane and Jackson), it would likely be more than ten years before these areas are revisited as a timber sale project. Where these projects are ongoing, or where a new project is being planned (Wolf) any potential road-to-trail conversions involving roads accessing active or planned harvest treatment units would not be implemented until affected harvest activity is completed. Also, due to the Project Design Features and objective of designing trails that are narrow and winding, removal of trees would be the exception rather than the standard and development of any of the proposed action alternatives would have a negligible impact on forested cover at the landscape scale.

Cultural Resources: Following guidelines in a 2003 Regional Programmatic Agreement (PA) among USDA-Forest Service, the Advisory Council on Historic Preservation, and the Oregon State Historic Preservation Office (SHPO), a finding of "*No Adverse Effect*" (No Historic Properties Affected) was recommended under Stipulation III (B) 5 of the Programmatic Agreement. The Forest finds that there are historic properties but the undertaking would have no adverse effect on them as defined by 36 CFR 800.16(i). Any potentially meaningful information that could contribute to the importance of a site that might otherwise be lost would due to project implementation would be documented and reported to the SHPO. This finding is based on Project Design Features and mitigation measures that have been incorporated into the EIS to assure that no sites eligible to the National Register would be impacted by trail or staging area construction.

The Historic Summit trail (FS Road 2630 in the analysis area) has been evaluated and found to be eligible to the National Register of Historic Places (NRHP). The Ochoco Land and Resource Management Plan (LRMP) provides direction for the Historic Summit Trail, which includes maintaining the existing historic integrity. Segments of the proposed OHV trail system on or crossing over FS Road 2630 are on existing open road segments, but all development associated with alternatives would still be designed for consistency with emphasis and desired conditions for the Historic Summit Trail (LRMP 4-61, 4-125, 4-180, 4-182, 4-190, 4-192 and 4-193). Monitoring of this site is included in the EIS (Chapter 2) and in the SHPO report. For those cultural sites that were evaluated and not found eligible for NRHP, protection is not required.

Harassment of Wildlife and significant disruption of wildlife habitats: Chapter 3 discloses the effects of motorized use on a myriad of wildlife and their individual habitats. Key Issue #2

specifically responds to the designation of a motorized trail system that could potentially impact big game habitat. In response to this key issue Alternative 3 was developed. Development of additional motorized routes and effective closure of unauthorized and unwanted routes work in opposing ways, and may alter reproductive success, mortality, availability of habitat or habitat quality. The effects may stem from changes in access for predators and people, fragmentation of habitat, behavioral changes in response to human use, impacts due to noise, or physical alteration of habitat. Generally new routes that are in close proximity to existing open motorized routes have a less detrimental impact on wildlife than routes that are far away from existing open motorized routes. This is because the amount of habitat that has a low level of human disturbance (as measured by motorized access) is retained over more area if new routes are planned in areas that are already disturbed, rather than when they are built into areas that are currently undisturbed. Refer to the Wildlife section for a detailed discussion of disturbance bands and other effects analysis related to proposed alternatives and wildlife.

Conflicts between motor vehicle use and existing or proposed recreational uses of the National Forest System lands or neighboring Federal Lands: Key Issue #4 specifically responds to the designation of a motorized trail system that could potentially cause conflict between motorized and non-motorized recreation. Designation of a motorized trail system would contribute to the separation of uses and provide areas for quiet recreation away from the designated system, while reducing the quality of quiet recreation in proximity to the designated system. A noiseband analysis using projected noise levels of >45 bd as an indicator of where the sound of OHVs on the proposed trail system was conducted to determine if various recreational values would be affected. There would be no effect from any of the action alternatives on following developed recreation sites and trails: Walton Lake CG, Biggs Spring CG, Big Spring CG, Deep Creek CG, Cottonwood CG, Wolf Creek CG, Sugar Creek CG, Barnhouse CG, Wildwood CG, Walton Lake Trail, Lookout Mountain Recreation Area Trail Systems, Round Mountain National Recreation Trail, Ochoco Mt. Trail, Barnhouse Trail, Cold Springs Rental Cabin, Crystal Springs Organization Camp, Marks Creek Sledding Hill. There would also be no effect on Bridge Creek Wilderness, North Fork Wild and Scenic River corridor, Lookout Mountain Recreation Area, 50 miles of trails managed exclusively for non-motorized use within the project area (except for a maximum of 0.03 miles of Keeton Trail). There is also potential for competition for sites to camp or picnic. However, all action alternatives include some level of supporting areas associated with the trail system, which would help reduce conflict with existing dispersed recreation sites. Reference the Recreation section for a discussion on the types of uses that occur on the Ochoco National Forest and how they are affected by this project.

Conflict among different classes of motor vehicle uses on National Forest System lands or neighboring Federal lands: User conflict happens when a person's expectations for his or her recreational experience are not met due to contact with another user or through disturbance from the sound or physical evidence left by another user. The potential for conflict exists among all user groups, and even within a user group. All three action alternatives were designed to provide some separation of the different classes of motor vehicles. However, all alternatives, including no action, incorporate use of OHVs on open mixed-use roads, so there is potential for conflict between OHV riders and standard motor vehicle drivers. Not all motorized conflicts on the National Forest are entirely recreation-based; the National Forest System provides a wide array of resource-based opportunities such as timber harvest, livestock grazing and mining all of which involve people traveling in motor vehicles. Reference the Recreation section for a discussion on the types of uses that occur on the Ochoco National Forest and how they are affected by this project.

*Compatibility of motor vehicle use with existing conditions in populated areas, taking into account sound, emissions, and other factor*s: The project area is not located near populated areas.

Nonetheless, analysis included sound and air quality (see Recreation and Air Quality sections in Chapter 3 of this document).

Public Safety: The analysis disclosed fugitive dust as a potential to affect health, although it would be localized and temporary. Trail construction would be engineered for curvilinear design to abate driver speed. Barriers, signs, and other trail delineators would be employed to reduce rider confusion. Crossings at highway-legal roads, and shared segments of open mixed use roads would be posted to alert drivers on the road of crossing or merging OHV traffic. Such intersections would also be posted with "STOP" signs and approaches that allow visibility of the cross traffic in both directions on the road for riders entering the road from either direction on the trail. Increasing use of the mixed-use routes over time would require monitoring of those routes to identify and address issues related to user safety.

Provision of Recreational Opportunities: As a result of implementation of the Travel Management Rule, this project develops a trail system and staging areas specifically for OHV enthusiasts and to provide a riding experience they have requested. This proposal would provide between 101 and 212 miles of designated interlinking trails and roads that would vary in skill level and density to provide an opportunity for beginner through advanced riders. The analysis also discloses the balance of motorized and non-motorized recreational opportunities, including the potential effect of noise on quiet recreation such as hiking in wilderness or inventoried roadless area. Designation of a motorized trail system should benefit the non-motorized user in portions of the landscape distant from the proposed motorized routes as it separates uses and provides an area for motorized use that is concentrated and managed rather than scattered and uncontrolled.

Access Needs: Section 504 of the Rehabilitation Act of 1973 says that no qualified individual with a disability can be denied participation in a Federal program that is available to all other people solely because of his or her disability. In conformance with section 504, wheelchairs or mobility devices are welcome on all NFS lands that are open to foot travel and they are specifically exempted from definition as a motor vehicle in section 212.1 of Travel Management Rule (36CFR 212.1). There is no legal requirement to allow persons with disabilities use of motor vehicles on roads, trails, or other areas that are closed to motor vehicles. Restrictions on motor vehicle use that are applied consistently to everyone are not discriminatory. This concern has already been decided by law.

Conflicts among Uses of National Forest System Lands: Chapter 3 of the EIS as a whole has a robust display of the tradeoffs associated with designation of a motorized trail system. For each resource area, there are potential conflicts as it is the nature of multiple use in the National Forest System. Key Issues drove alternatives to address the most notable conflicts and concerns. These issues include motorized use and its effect on big game habitat, water quality and fish habitat, potential conflict between motorized and non-motorized recreation and quality and quantity of recreational opportunities for OHV riders. For other conflicts among uses such as potential incursion into adjacent sensitive plant habitat or wet areas, impacts to cultural sites eligible for the National Register, project design criteria, mitigations and monitoring are included in the EIS (Chapter 2) to reduce adverse effects and to ensure that the trail system is properly designed, constructed, maintained and operated to reduce these potential conflicts.

The Need for Maintenance and Administration of Roads, Trails, and Areas that would arise if the Uses under Consideration are designated; and The Availability of Resources for that Maintenance and Administration: The project design criteria (PDC) in Chapter 2 include design, construction and maintenance guidelines. Safety played a key role in the development of the trail design and maintenance standards. Education and enforcement are also addressed in the OHV Trail Design PDCs. and in the Recreation section of the EIS. Enforcement will be led by

COHVOPS in cooperation with local law enforcement officers and volunteer patrols. Maintenance and monitoring will be conducted in accordance with all of the PDCs and will be led by COHVOPS in cooperation with local resource specialists, OHV groups and/or other interested agencies, groups or individuals. The mission of COHVOPS is to provide consistent, quality off-highway vehicle recreation opportunities that are focused on customer service and resource protection. COHVOPS manages the central Oregon OHV trail systems for the Deschutes and Ochoco National Forests and the Prineville BLM. The team implements existing OHV management plans, identifies future needs, recommends actions to management, and assists in future OHV planning efforts. COHVOPS is funded through a combination of direct support from the Forest Service, the BLM, and grant funding from the State of Oregon derived from the ATV Allocation Funds derived from the ATV Permit program and a portion of gas tax revenue.

212.55(c) Specific Criteria for Designation of Roads

(1) Speed, volume and composition on roads; and (2) Compatibility of vehicle class with road geometry and road surfacing: As part of implementation of the Travel Management Rule on the Ochoco National Forest, motorized mixed use analysis has been performed to establish the suitability of allowing motorized mixed use on roads in the context of their current setting in terms of alignment, width, typical user speed, and presence or absence of traffic control devices. Supplemental analysis has been performed on certain designated motorized mixed-use roads in the Analysis Area that have been determined to be unsuitable for a mixture of non-highway legal and highway-legal vehicles because of either their current setting or their designation as roads maintained for passenger car use (on which non-highway-legal vehicle use is prohibited). In particular, this supplemental Engineering Analysis was done on Rd 2200-150, Rd 2630 (to Indian Prairie), Rd 2630 (Scott's Camp for 2 miles west), Rd 4250, Rd 4270, Rd 4200-740, Rd 38, Rd 3810 and Rd 4276 to determine what mitigations would be necessary to reduce the crash probability and severity on these motorized mixed use roads to an acceptable level. It was disclosed that these routes would not be appropriate for mixed use due to safety concerns without modifications to alleviate those hazards. For this analysis those road segments along with all of the Maintenance Level 3, 4 and 5 roads were considered to be not available for designation as OHV routes and are not included in the proposed alternatives except a crossings of the trail over highway-legal roads. A sign plan would be developed that would include posting of all shared use routes within the Ochoco Summit OHV Trail designated OHV system with confirmation signing for the presence of OHVs as well as signs alerting traffic on highway-legal roads to the presence of OHV crossings.

No valid existing right-of-ways would be affected by the action alternatives. There has been no change or designation of motorized use in wilderness or primitive areas per CFR 212.6(b).

National Forest Management Act

The National Forest Management Act (NFMA) directs all action taken on National Forests to be consistent with the Forest Land and Resource Management Plans prepared in accordance with the regulations of the NFMA. The regulations in this subpart set forth a process for developing, adopting, and revising land and resource management plans for the national Forest System as required by the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended. These regulations prescribe how land and resource management planning is conducted on National Forest System lands. The resulting plans shall provide for multiple use and sustained yield of goods and services from the National Forest System in a way that maximizes the long-term net public benefits in an environmentally sound manner. Guidelines for modification of management areas or prescriptions are provided in the LRMP (4-47 and Chapter 5).

Forest Plan Consistency- Ochoco National Forest

Federal regulations (36 CFR 219.10(e)) require that permits, contracts, cooperative agreements, and other activities carried out on the Ochoco National Forest be consistent with the Ochoco National Forest Land and Resource Management Plan, as amended (see FEIS page 260). Accordingly, I have reviewed my decision against Forest Plan direction. I find this decision to be consistent with the long term objectives as discussed in the Forest Plan as amended except as discussed below in the section titled "Forest Plan Amendments."

The Ochoco National Forest Plan has a variety of Standards and Guidelines that restrict some or all motorized access within certain Management Areas. In the past, this guidance was translated into Travel Plan maps that were published for summer and winter. The Motor Vehicle Use Map (MVUM) published after the release of the Record of Decision for the Travel Management Rule functions as the new Travel Map for the Ochoco National Forest. Separate trail system maps would be published after the Record of Decision has been signed for the Ochoco Summit OHV project.

Non-Significant Forest Plan Amendments

The Forest Service Manual indicates that the need to amend a land management plan may arise from several sources, including (but not limited to) the desire to implement projects or activities outside the scope of the land management plan (FSM 1926.5). In order to be considered non-significant, proposed amendments must meet the following criteria, as defined in Forest Service Manual 1926.51:

1. Actions that do not significantly alter the multiple use goals and objectives for long term land and resource management (Forest Plan Level).
2. Adjustments of management area boundaries or management prescriptions resulting from further on-site analysis when the adjustments do not cause significant changes in the multiple use goals and objectives for long term land and resource management.
3. Minor changes in standards and guidelines.
4. Opportunities for additional projects or activities that will contribute to the achievement of the management prescription.

There are three site specific amendments to the Ochoco Land and Resource Management Plan for Alternatives 2, 3, and 4 and one additional amendment that applies only to Alternatives 2 and 4. All of these are related to designation of motorized crossings in Old Growth Management Areas (MA-F6) allocated in the 1989 LRMP other than on constant service roads (4-232, 4-234):

1. Old Growth Management Area (OG-D1-08) at Indian Butte to include motorized recreation only on designated routes including one new crossing to connect between roads 2200-306 and 2200-309. This amendment applies to Alternatives 2, 3 and 4.
2. Old Growth Management Area (OG-D1-12) at East Porter to include motorized recreation only on designated routes including one new crossing at Looney Creek to connect between roads 4200-430 and 4200-440. This amendment applies to Alternatives 2, 3 and 4.
3. Old Growth Management Area (OG-D2-1) near Chamberlin Spring to include motorized recreation only on designated routes including one crossing on closed road 4250-700 to connect between roads 4250-610 and 1200-440. This amendment applies to Alternatives 2 and 4.

4. Old Growth Management Area (OG-D2-02) near Deep Creek to include motorized recreation only on designated routes including one new crossing. This amendment applies to Alternatives 2, 3 and 4.

Each of these proposed amendments represents a minor change in the Forest Plan standards and guidelines that preclude motorized recreation in Old Growth Management Areas. These amendments would not alter the multiple use goals and objectives for long term land and resource management

Endangered Species Act

Effects to Threatened, Endangered species are evaluated in the Aquatic Species, Botanical Resources, and Wildlife sections of Chapter 3 of this EIS. The Endangered Species Act of 1973 requires that actions of federal agencies do not jeopardize or adversely modify critical habitat of federally-listed species. The purposes of this Act are to "provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered and threatened species, and to take such steps as may be appropriate to achieve the purpose of the treaties and conventions set forth in subsection (a) of this section." The Act also states "It is further declared to be the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act."

There are no federally listed Threatened or Endangered fish, wildlife or native plant species on the Ochoco National Forest. There are two federal Candidates that have been found by USFWS to be "warranted but precluded" for listing as threatened under ESA. These are the greater sage-grouse and the California wolverine. These species are addressed in the Wildlife section.

Clean Water Act

The objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of all waters to protect the beneficial uses as documented according to Oregon Department of Environmental Quality (ODEQ) criteria. A beneficial use is a resource or activity that would be directly affected by a change in water quality or quantity and are defined on a basin Action alternatives follow State of Oregon requirements in accordance with the Clean Water Act for protection of waters. Application of Best Management Practices (BMPs) are selected and designed on site-specific conditions for waters potentially affected in the Ochoco Summit OHV project area. The interdisciplinary team has reviewed and incorporated applicable BMP water quality objectives in the design of alternatives and their mitigation measures. Standards and Guidelines for the Inland Native Fish Strategy where developed (in part) to maintain and restore aquatic ecosystems for dependent species (Chapter 3, Aquatic Species and Hydrology). These standards and guidelines afford the same or greater protection of stream courses as direction found in the 1988 USDA publication *General Water Quality – Best Management Practices.* Project design criteria for water quality and aquatic species are listed in Chapter 2.

Under Section 319 of the 1987 Clean Water Act Amendments, states are required to determine those waters that would not meet the goals of the Clean Water Act, determine those non-point source activities that are contributing pollution, and develop a process on how to reduce such pollution to the "maximum extent practicable." Section 303(d) of the Clean Water Act requires that a list be developed of all impaired or threatened waters within each state. The ODEQ is responsible for compiling the 303(d) list, assessing data, and submitting the 303(d) list to the Environmental Protection Agency (EPA) for federal approval.

Within the project area there are several streams with assessed water quality impairments related to summer water temperature. These include Double Corral Creek, Fox Creek, Happy Camp

Creek, Howard Creek, Indian Creek, Jackson Creek, Little Summit Creek, Marks Creek, North Wolf Creek, Ochoco Creek, Peterson Creek, Porter Creek, and Toggle Creek. These streams are on Oregon's 2004/2006 Section 303(d) List of "Water Quality Limited Waterbodies." The Oregon State Water Quality Standards states that the seven-day-average maximum temperature of a stream identified as having salmon and trout rearing and migration use, which describes some streams within the project area, may not exceed 18.0 degrees Celsius (64.4 degrees Fahrenheit). No measurable increase in water temperature from management practices is allowed in these streams.

All activities within the Ochoco Summit OHV project area would not change the 303(d) parameters for which Double Corral Creek, Fox Creek, Happy Camp Creek, Howard Creek, Indian Creek, Jackson Creek, Little Summit Creek, Marks Creek, North Wolf Creek, Ochoco Creek, Peterson Creek, Porter Creek, and Toggle Creek are listed. Reference the Hydrology section (Chapter 3 of this document) for more detail.

Executive Orders

11644 of February 8, 1972

Use of Off-road Vehicles on the Public Lands

Sec. 3. *Zones of Use.* (a) Each respective agency head shall develop and issue regulations and administrative instructions, within six months of the date of this order, to provide for administrative designation of the specific areas and trails on public lands on which the use of off-road vehicles may be permitted, and areas in which the use of off-road vehicles may not be permitted, and set a date by which such designation of all public lands shall be completed. Those regulations shall direct that the designation of such areas and trails will be based upon the protection of the resources of the public lands, promotion of the safety of all users of those lands, and minimization of conflicts among the various uses of those lands. The regulations shall further require that the designation of such areas and trails shall be in accordance with the following--

(1) Areas and trails shall be located to minimize damage to soil, watershed, vegetation, or other resources of the public lands.

Chapter 3 of this document displays the effects in detail to these specific resources. Also, see response to the Travel Management Rule CFR 255(a) and (b) in this section.

(2) Areas and trails shall be located to minimize harassment of wildlife or significant disruption of wildlife habitats.

Chapter 3 discloses the effects of motorized use on wildlife and their individual habitats. Significant Issue #2 specifically responds to the designation of a motorized trail system that could potentially alter effectiveness big game habitat. Alternative 3 responds to this Significant Issue.

(3) Areas and trails shall be located to minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands, and to ensure the compatibility of such uses with existing conditions in populated areas, taking into account noise and other factors.

All three action alternative provide for some degree of separation of use. Alternatives 2 and 4 would offer opportunities for all three classes of vehicles (ATVs, jeeps and 4-wheel drive vehicles, motorcycles). Alternative 3 would specifically provide opportunities for ATVs and motorcycles; jeeps and 4x4s would still have access to all mixed-use roads.

(4) Areas and trails shall not be located in officially designated Wilderness Areas or Primitive Areas. Areas and trails shall be located in areas of the National Park system, Natural Areas, or National Wildlife Refuges and Game Ranges only if the respective agency head determines that

off-road vehicle use in such locations will not adversely affect their natural, aesthetic, or scenic values.

There are no trails located in Wilderness, Inventoried Roadless, or Potential Wilderness Areas. See the Recreation, the Visual Quality, and the Wilderness, Inventoried Roadless Area and Unroaded Area sections in Chapter 3 for more details.

(b) The respective agency head shall ensure adequate opportunity for public participation in the promulgation of such regulations and in the designation of areas and trails under this section.

The public participation process is outlined in Chapter 1 of this document.

(c) The limitations on off-road vehicle use imposed under this section shall not apply to official use.

Maintenance Level 1 roads would remain closed to the public; however administrative use is maintained.

11988 & 11990 of May 24, 1977

Protection of Floodplains and Wetlands

Executive Order 11988 requires the Forest Service to provide leadership and to take action to (1) minimize adverse impacts associated with occupancy and modification of floodplains and reduce risks of flood loss, (2) minimize impacts of floods on human safety, health, and welfare, and (3) restore and preserve the natural and beneficial values served by floodplains. Executive Order 11990 requires the Forest Service to take action to minimize destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.

Hydrology: The Forest Service is proposing to designate where and what types of motorized access would be allowed within the riparian influence zone in every alternative except Alternative 1, in which motorized access would be allowed in areas currently authorized by the Travel Management Plan. All action alternatives include design criteria for trail construction and monitoring within riparian areas.

Aquatic Biota: All alternatives comply with the intent of Executive Order 11990 and USDA Departmental Regulation 9500-3 by either not designating trail in riparian areas (Alternative 1) or providing a properly constructed designated trail system within riparian areas (Alternatives 2-4). See discussions related to this topic in Hydrology, Aquatic Species, and Soils resource sections in Chapter 3 for more information.

13186 of January 10, 2001, and the Migratory Bird Treaty Act of 1918

The purpose of the Migratory Bird Treaty Act is to establish an international framework for the protection and conservation of migratory birds. The Act makes it illegal, unless permitted by regulations, to “pursue, hunt, take, capture, deliver for shipment, ship, cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, including in this Convention…for the protection of migratory birds…or any part, nest, or egg of any such bird” (16USC 703). The original 1918 statute implemented the 1916 Convention between the United States and Great Britain (for Canada). Later amendments implemented treaties between the Unites States and Mexico, Japan, and the Soviet Union (now Russia).

Executive Order 13186, signed January 10, 2001, directs federal agencies to protect migratory birds by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practical, adverse impacts on migratory birds’ resources when conducting agency actions. This order directs agencies to further comply with the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, and other pertinent

statutes. This analysis is compliant with the National Memorandum of Understanding between the USDA Forest Service and the U.S. FWS to promote the conservation of migratory birds (USDA 2008g).

For a more detailed analysis see the Wildlife section in Chapter 3.

13443 of August 16, 2007

Facilitation of Hunting Heritage and Wildlife Conservation

This order directs federal agencies that have programs and activities that have a measurable effect on public land management, outdoor recreation, and wildlife management to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat.

This EIS has considered the management of wildlife habitats trends in and effects on hunting opportunities, and economic and recreational values of hunting. Resource specialists have considered the programs and plans of other state and federal wildlife agencies, have worked collaboratively with them in their professional roles, and have coordinated with them in development of Ochoco Summit OHV project. These other agencies have been kept abreast of these proposed actions. The Ochoco National Forest currently has in place various cooperative seasonal motorized use closures, including winter range motorized closure areas, a year-round Cooperative Travel Management area (South Boundary) and the “Green Dot” hunting season road closures (Rager Travel Management Area). Proposed alternatives were developed with consideration of these areas and seasons.

12898 of February 11, 1994

Environmental Justice in Minority Populations and Low-income Populations

Executive Order 12898 directs the agency to identify and address, “...as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations....” The intent of the order is to assure the fair treatment and meaningful involvement and consideration of all people. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from the execution of a federal actions. Outreach and public involvement for this project has been extensive and at various scales within various communities of interest.

In order to identify and address environmental justice concerns, the EO states that each agency shall analyze the environmental effects, including human health, economic, and social effects of Federal actions, including effects on minority populations, low-income populations, and native Americans as part of the NEPA process.

Two distinct populations fall into the categories identified by EO 12898. One population is the harvesters, most of whom are members of the Asian minority. In Environmental Justice analyses, Census data is often used to illustrate the percentage of the population that belongs to an ethnic minority in the study area. Data usually come from sources similar to those presented in the Social and Economic section.

As a result of outreach and scoping (public involvement) processes, there were no potentially disproportionately high and adverse human-health, environmental, or social effects to minority or low-income populations identified. Based on the Social and Economic analysis presented in Chapter 3, there is no known potential for disparate or disproportionate effects on minority or low-income populations.

USDA Civil Rights Policy

The Civil Rights Policy for the USDA, Departmental Regulation 4300-4 dated May 30, 2003, states that the following are among the civil rights strategic goals; (1) managers, supervisors, and other employees are held accountable for ensuring that USDA customers are treated fairly and equitably, with dignity and respect; and (2) equal access is assured and equal treatment is provided in the delivery of USDA programs and services for all customers. This is the standard for service to all customers regardless of race, sex, national origin, age, or disabilities.

The project alternatives, given the size of potential social and economic effects, are not likely to result in civil rights impacts to Forest Service employees or customers of its program.

Persons with Disabilities

Some comments received during the Ochoco Summit OHV planning process expressed concern that changes to motorized access would prevent future access to National Forest system lands for those with disabilities. In response to these comments, a review of the project alternatives has been conducted to ensure that they apply equally to all groups. Therefore, the Ochoco Summit OHV project is not discriminatory towards persons with disabilities, because it applies equally to all groups.

Under section 504 of the Rehabilitation Act of 1973, no person with a disability can be denied participation in a Federal program that is available to all other people solely because of his or her disability. There is no legal requirement to allow people with disabilities use of motor vehicles on roads, trails, or other areas that are closed to motor vehicles. Restrictions on motor vehicle use that are applied consistently to everyone are not discriminatory.

Prime Farmland, Rangeland, and Forest Land

The Secretary of Agriculture issued memorandum 1827 which is intended to protect prime farm lands and rangelands. The Ochoco Summit OHV project area does not contain any prime farmlands or rangelands. Prime Forest Land, as defined in the memorandum, is not applicable to lands within the National Forest System.

CHAPTER 4. CONSULTATION AND COORDINATION

Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this draft environmental assessment:

ID TEAM MEMBERS:

Barb Franano, Fisheries Biologist
Bret Friel, Archeologist
Brian Kurtz, Engineering
Carrie Gordon, Geologist
Deb Mafera, Botanist
Dede Steele, Team Leader and Wildlife Biologist
Diane Hopster, Hydrologist
Greg Hooper, COHVOPS
Holly Myers, Range Conservationist
Jim David, Soil Scientist
Kent Koeller, Recreation Planner
Marcy Anderson, Environmental Coordinator
Ramon Alonso, Transportation Planner/Road Manager

EXTENDED ID TEAM MEMBERS:

Jim Grace, GIS Specialist
Ken Kittrell, Transportation Planner/Road Manager

FEDERAL, STATE, AND LOCAL AGENCIES:

Crook County
Environmental Protection Agency, Office of Federal Activities
Environmental Protection Agency, Region 10
Oregon Department of Fish and Wildlife
U.S. Fish and Wildlife Service

TRIBES:

Confederated Tribes of the Warm Springs Reservation
The Burns Paiute Tribe
The Klamath Tribes

INDIVIDUALS:

Dick Dufourd
Joseph and Marcella Edmonds
Robert Ericsson
Gary Ervin
Mike and Teresa Ervin
Jennifer Fairbrother
Brian Ferry
Jeff B. Fields
Dennis M. Fish
Dennis Flaherty
Bob Flint
Bob Freimark
Lonny W. Gallagher
Michael Gerdes
William W. Glenn
Don Gore
Bill Gowen
Ron Grace
Ethan Wilcox Green
Noel Groshong
Wendell Gump
Matt H
Ron Haas
Glenn Hanna
Rick Hansen
Donna Harris
Tyrrell Hart
Hugh Heck
William J. Herrick

Kurt P. Herzog
Josh Hicks
Brett Hodgson
Jerry Honl
Bob and Kenna Hoyser
Gayle Hunt
Cheryl Ingersoll
Wayne Jacox
Don James
Chris Johnson
Herbert and Virginia Jones
Rance Kastor
Greer Kelly
Dave Kimball
Mary Ann Kruse
Brad Lasniewsky
Chandra LeGue
Bob and Susan Lever
Tim Lillebo
Ethan Lodwig
Keith A. Lund
Mike Lunn
Allen Mann
Pat Marquis
Peter Mayer
Kim McCarrel
Scott McCaulou
Barbara McKillip
Marilyn Miller
John Morgan
Michael J. Morris
Richard Nelson
Linda Nolte
Dan Paige
Aaron Palmquist
Rick and Danielle Paul
Chris Paulson
Anthony Peiffer
Eric Peterson
James Peterson
David Peterson
Wade Popham
Crista Porfily
Scott Porfily
Grant Porfily
Nash Porfily
Holt Porfily
Dan Portwood
Edd Price
Jean Public
Carrie Puckett
Brett Puckett
Caleb Puckett
Layne Puckett
Craig Puckett
Jon and Patti Pyland
Daniel Quinn
Paul Quinn
Zac Ramey
Randy Rasmussen
Bill Richardson
Jared Richenbach
Joe Ricker
Keith Riehl
Stan Rodgers
Mr. & Mrs. R. A. Ross
Renee Roufs
Marvin Schenck
Gordon Scott
Tom C. Scott
Gary Scott
Kenna Scott
Kenton Scott
Teri Scott
Ray and Bonnie Sessler
Isaac Shepherd
Ed Sink
Barbara Smith
Trent Smith
Paul Smith
James H. Smith
Kathy Smith
Darek Staab
Janice Staats
Scott Staats
Martin A. Stegman
Amy M. Stuart
Ben Sunderland
John Taggart
Allen Teskey
Billy Toman
Dennis and Linda Tribby
Scott Turo
Tyler Groo
Larry Ulrich
Roberta Vandehay
Tim VanDomelen
Larry VanZyl
Tim and Denise Walker
Art Waugh
John Weber
Mr. Phil White
Dave Wiling
Chuck Williams
Rick Wobbe
Becky Wolf
Don Wood
Craig Woodward
Lucy Woodward
Clay Woodward
Kim Woodward
Clark Woodward
Cade Woodward
Kenna Woodward
Ronald S. Yockim
Berta Youtie
Randy Zustiak

ORGANIZATIONS:

American Hiking Society
Blue Mountains Biodiversity Project
Blue Ribbon Coalition
Central Oregon Wild Horse Coalition
Chamber of Commerce
Cherry Family Trust
Crook County Judge
Crook County NRPC
Crooked River Watershed Council
Crooked River Weed Mgt. Area
Deschutes County 4-Wheelers
Deschutes Resource Conservancy
Emerald Trail Riders Association
Forest Service Employees for Environmental Ethics
Friends of McKay
Interfor Pacific
Klamath Basin OHV Club
Lobos Motorcycle Club Inc.
Ochoco Lumber Company

Ochoco Trail Riders
Odell Lake Resort
Oregon Hunters Association
Oregon Hunters Association, Bend Chapter
Oregon Hunters Association, Capitol Chapter
Oregon Hunters Association, Redmond Chapter
Oregon Wild!
Pacific Northwest 4 Wheel Drive Association
Prineville Power Sports
Prineville Sawmill Co., Inc.
Rocky Mtn. Elk Foundation
The Wilderness Society
Trout Unlimited
Wolfpack 4 x 4s

References

Adams, J.A., A.S. Endo, L.H. Stolzy, P.G. Rowlands, and H.B. Johnson. 1982a. Controlled experiments on soil compaction produced by off-road vehicles in the Mojave Desert, California. Journal of Applied Ecology 19:167-175.

Adams, J.A., L.H. Stolzy, A.S. Endo, P.G. Rowlands, and H.B. Johnson. 1982b. Desert soil compaction reduces annual plant cover. California Agriculture, September-October.

Agee, J. K. 1993. Fire ecology of Pacific Northwest forests. Washington, DC: Island Press; 493 p.

Ahlenslager, K. and Laura Potash. 2007. Conservation Assessment for 13 Species of Moonworts (Botrychium Swartz subgenus Botrychium). USDA Forest Service, unpublished.

Albright, Del. What to Do in this Trying Economy. [Online] October 2008. <http://www.sharetrails.org/magazine/article.php?id=1636>.

Arno, S.F., 2000. Fire in western forest ecosystems. In: Brown, J.K., Smith, J.K., (Eds.), Wildland Fire and Ecosystems: Effects of Fire on Flora. Gen. Tech. Rep. RMRS-GTR-412-vol 2, USDA Forest Service, Ogden, UT, pp. 97–120.

Beatty, B.L., W.F. Jennings and Rebecca C. Rawlinson. 2003. Botrychium ascendens (trianglelobe moonwort) Botrychium crenulatum (scalloped moonwort) Botrychium lineare (narrowleaf grapefern): A Technical Conservation Assessment. USDA Forest Service, Rocky Mountain Region, Species Conservation Project.

Belnap, J. 1993. Recovery Rates of Cryptobiotic Crusts: Inoculant Use and Assessment Methods. Great Basin Naturalist 53(1):89-95.

Belnap, J. 1995. Surface Disturbances: Their Role in Accelerating Desertification. Environmental Monitoring and Assessment 37:39-57.

Belnap, J., R. Rosentreter, S. Leonard, J.H. Kaltnecker, J. Williams, and D. Eldridge. 2001. Biological Soil Crusts: Ecology and Management. U.S. D.I. Bureau of Land Management, Denver, Colorado.

Belnap, J. 1997, Introduction to Microbiotic Crusts, USDA- Natural Resources Conservation Service.

Belnap, J. 2002. Impacts of off-road vehicles on nitrogen cycles in biological soil crusts: resistance in different U.S. deserts. Journal of Arid Environments 52:155-165.

Belt, G., J. O'Laughlin and T. Merrill. 1992. Design of Forest Riparian Buffer Strips for the Protection of Water Quality: Analysis of Scientific Literature, Idaho Forest, Wildlife and Range Policy Analysis Group, Report No. 8.

Bergerson, T., et al. Oregon Trails 2005-2014: A Statewide Action Plan. [Online] February 2005. <http://egov.oregon.gov/ORPD/PLANS/trailsplanning.shtml>.

Bjornn, T.C., and D.W. Reiser. 1991. Habitat requirements of salmonids in streams. American Fisheries Society Special Publication 19:83-138.

Bjornn, T.C., M.A. Brusven, M.P. Molnau, and J.H. Milligan. 1977. Transport of granitic sediment in streams and its effects on insects and fish. University of Idaho, College of Forestry, Wildlife and Range Sciences, Bulletin Number 17. Moscow, Idaho.

Bolling, J.D. and L.R. Walker. 2000. Plant and soil recovery along a series of abandoned desert roads. Journal of Arid Environments 46: 1-24.

Brooks, M.L. and B. Lair. 2005. Ecological Effects of Vehicular Routes in a Desert Ecosystem. Report prepared for the U.S. Geological Survey, Recoverability and Vulnerability of Desert Ecosystems Program. http://geography.wr.usgs.gov/mojave/rvde.

Brown, E.C. and T. P. Thayer, 1966. "Geologic Map of the Canyon City Quadrangle Northeastern Oregon," Oregon Department of Geology and Mineral Industries, USGS, Miscellaneous Geologic Investigations Map I-447.

Buckley, Geofrey L. 1992. Desertification of the Camp Creek Drainage in Central Oregon. 1826-1905. Masters Thesis. University of Oregon. Eugene, OR.

Bull, E.L. and M.P. Hayes. 2001. Post-breeding season movements of Columbia spotted frogs (Rana luteiventris) in northeastern Oregon. Western North American Naturalist 61:119-123.

Bull, E.L. and M.P. Hayes. 2002. Overwintering of Columbia spotted frogs in northeastern Oregon. Northwest Science. 76:141-147.

Bull, E.L.; Shepherd, J.F. 2003. Water temperature at oviposition sites of Rana luteiventris in northeastern Oregon. Western North American Naturalist. 63:108-113.

Burroughs, Edward R. Jr.; John G. King. 1989. Reduction of Soil Erosion on Forest Roads. Intermountain Research Station. General Technical Report INT-264

Christy, J.A. 2006. Species Fact Sheet for Tortula mucronifolia. Unpublished report for USDA Forest Service, Pacific Northwest Region. www.fs.fed.us/r6/sfpnw/issssp/documents/planning-docs

Cordova, J.J. 1995. Streamside forest, channel constraint, large woody debris characteristics, and pool morphology in low order streams, Blue Mountains, Oregon. M.S. thesis, Oregon State University, Corvallis, OR. 143 p.

Cordell, H.K., C.J. Betz, G.T. Green, and B.Stephens. 2008a. Off-Highway Vehicle Recreation in the United States and its Regions and States: A National Report from the National Survey on Recreation and the Environment (NSRE). [Online] February 2008. <http://warnell.forestry.uga.edu/nrrt/nsre/IrisReports.html>.

Cordell, H.K., C.J. Betz, G.T. Green, and S.H. Mou. 2008b. Outdoor Recreation Activity Trends: What's Growing, What's Slowing? [Online] September 2008. <http://warnell.forestry.uga.edu/nrrt/nsre/IrisReports.html>.

Crimmins, T.M. Management Guidelines for OHV Recreation. [Online] 2006. <http://www.NOHVCC.org/education/tools.asp>.

Croft, L., W.R. Owen, J.S. Shelly. 1997. Interior Columbia Basin Ecosystem Management Project Analysis of Vascular Plants. USDA Forest Service publication.

Davidson, E. and M. Fox. 1974. Effects of Off-Road Motorcycle Activity on Mojave Desert Vegetation and Soil Madrono 22(8):381-412.

Department of Commerce, National Oceanic and Atmospheric Administration 50 CFR Part 600. Dumas, P.C. 1966. Studies of the Rana species complex in the Pacific Northwest. Copeia 1966:60-74).

Dewey, Rick. 2011. Draft Conservation Strategy for Calochortus longebarbatus Wats. var. peckii Ownbey For the Ochoco and Malheur National Forests and the Prineville BLM District. Unpublished.

Dewey, Rick. 2010 Conservation Assessment for Henderson's needlegrass (Achnatherum hendersonii) and Wallowa needlegrass (Achnatherum wallowaensis). USDA Forest Service Region 6 and USDI Bureau of Land Management, Oregon and Washington.

Dunham, J. B.; M. K. Young, R. E. Gresswell, B. E. Rieman. 2003. Effects of fire on Fish populations: landscape perspectives on persistence on native fishes and nonnative fish invasions. US Forest Service, Rocky Mountain Research Stations, Boise, ID.

Fiedler P.L. 1987. Life History and Population Dynamics of Rare and Common Mariposa Lilies (Calochortus Pursh: Liliaceae). Journal of Ecology (1987) 75, 977 995.

Flather, C. H, Joyce, L A, Bloomgarden, C A. 1994. Species endangerment patterns in the United States. Ft. Collins (CO): US Department of Agriculture Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report no. RM-241.

Fredricks, N. 1989. Preliminary Status Report for Calochortus longebarbatus var. peckii. Unpublished Oregon Department of Agriculture Report submitted to the Ochoco National Forest.

Frest, Terrence J; Edward J. Johannes. 1999. Field Guide to Survey and Manage Freshwater Mollusk Species.

Furniss, M. J., Flanagan, S. A., and McFadin, B., 2000, Hydrologically-connected roads: an indicator of the influence of roads on chronic sedimentation, surface water hydrology, and exposure to toxic chemicals: Stream Notes, July 2000.

Gamperl AK, Rodnick KJ, Faust HA *et al. (*2002*)* Metabolism, swimming performance, and tissue biochemistry of high desert redband trout (*Oncorhynchus mykiss ssp*.): evidence for phenotypic differences in physiological function. *Physiological and Biochemical Zoology,* **75**, 413–431.

Geehan, Patrick H., 1984, letter from BLM deputy state director for Mineral Resources, included in the Ochoco Lumber Land Exchange Mineral Potential Report March 14, 1994.

Geist, J. M. and. Froehlich, H. A; 1994; Basis and Principles of Subsoiling in Forest Ecosystems, unpublished USFS paper.

Gonthier, Joseph B., 1985, "A Description of Aquifer Units in Eastern Oregon," U.S. Geological Survey Water-Resources Investigations Report 84-4095, 39 pages.

Gordon, Caroline, September 27, 2004, "HEJ Watershed Analysis Geology report", 24 pg.

Glavich, D.A., and Linda H. Geiser. 2004. Dermatocarpon meiophyllizum Vainio in the US Pacific Northwest. Evansia Volume 21 (3).

Gordon, Nancy D., Thomas A. McMahon, Brian L. Finlayson. 1992. Stream Hydrology, An Introduction for Ecologists. 526 pp.

Graham, R.T., S. McCaffrey, and Theresa B. Jain. Eds. 2004. Science Basis for Changing Forest Structure to Modify Wildfire Behavior and Severity. RMRS-GTR-120. USDA Forest Service.

Groom, J.D., L.B. McKinney, L.C. Ball, and C.S. Winchell. 2007. Quantifying off-highway vehicle impacts on density and survival of a threatened dune-endemic plant. Biological Conservation 135:119-134.

Havlick, David G. 2002. No Place Distance: Roads and Motorized Recreation on America's Public Lands. Island Press. Washing D.C. 297 pp.

Harrison, R. ; Hartmann, L. ; Makel, W . 1992. Report To Congress - Potential Impacts Of Aircraft Overflights of National Forest System Wildernesses. 9223 1208. San Dimas, CA: U.S. Department of Agriculture, Forest Service, San Dimas Technology and Development Center. 185 p.

Harrison, R. ; Makel, W ; Besse, L. 1993. Sound Levels of Five Motorcycles Travelling Over Forest Trails. 9323 1802. San Dimas, CA: U.S. Department of Agriculture, Forest Service, San Dimas Technology and Development Center. 10 p.

Harvey, A. 1991. Organic Matter Function in the Western Montane Forest Soil System, Deborah Page-Dumroese, Al Harvey, Martin Jurgensen and Russell Graham; In the proceedings of The Management and Production of Western Montane Forest Soils, Boise, Idaho; USDA-Forest Service, Intermountain Research Station, General Technical Report INT-280.

Henderson, J. Proc. Cal. Acad. Sci., vol. 18, p. 224, pl 24, figs. 3,4 (Celilo, OR) 1929.

Ingram, E.R. 1997. Department of Botany and Plant Pathology, Oregon State University, Corvallis, Oregon 97331-2902. Organisms in the Soil: Functions of Bacteria, Fungi, Protozoa, Nematodes and Arthropods.

Johnson, C. and Rodrick R. Clausnitzer. 1991. Plant Associations of the Blue and Ochoco Mountains. USDA Forest Service publication R6-ERW-TP-036.

Jones, J.A., F.J. Swanson, B.C. Wemple, and K.U. Snyder. 2000. Effects of Roads on Hydrology, Geomorphology, and Disturbance Patches in Stream Networks. Conservation Biology, Volume 14, No. 1, February 2000, p. 76-85.

Kagan, J. 1996. Final Draft Species Management Guide for Calochortus longebarbatus Wats. var. peckii Ownbey. Unpublished report submitted to the Ochoco National Forest. Oregon Natural Heritage Program, Portland, OR.

Kaltenecker, J.H., M. C. Wicklow-Howard, and M. Pellant. 1999. Biological soil crusts: natural barriers to Bromus tectorum L. establishment in the northern Great Basin, USA. In: Eldridge, D. and D. Freudenberger, editors, Proceedings of the VI International Rangeland Congress, Townsville, Queensland, Australia, July 19023, 1999.

Kolbe C.M. and M.W. and Luedke, 1993. A guide to freshwater ecology. Texas Natural Resource Conservation Commission. Austin, TX. 138p.

Kovalchik, Bernard L.; Riparian Zone Associations of the Deschutes, Ochoco, Fremont and Winema National Forests, USDA-Forest Service, Pacific Northwest Region, R6 Ecology TP-279-87

Kutiel, P., E.Eden, and Y. Zheveley. 2000. Effect of experimental trampling and off-road motorcycle traffic on soil and vegetation of stabilized coastal dunes, Israel. Environmenal Conservation 27(1):14-23.

Laycock, W. A. 1989. Stable States and Thresholds of Range Condition in North American Rangelands: A Viewpoint.

La Marche, J.L. and D.P. Lettenmaier. 2001. Effects of Forest Roads on Flood Flows in the Deschutes River, Washington. Earth Surface Processes and Landforms, Volume 26, p. 115-134.

Leitritz, E., and R.C. Lewis. 1980. Trout and Salmon Culture. Sacramento: California Department of Fish and Game, Bulletin 164. 197 pp.

Lesher, R.D., Derr, C.C. and Linda H. Geiser. 2000. Management Recommendation for Survey and Manage Lichens. Version 2.0 USDA Forest Service, unpublished.

Lindberg, K. 2009. The Economic Impacts of Off-Highway Vehicle (OHV) Recreation in Oregon. Prepared for the Oregon Parks and Recreation Department. Oregon State University.

Lovich, J.E. and D. Bainbridge. 1999. Anthropogenic Degradation of the Southern California Desert Ecosystem and Prospects for Natural Recovery and Restoration. Environmental Management 24(3):309-326.

Ma and others; 2003; Effect of Burning and Thinning on Soil Respiration, Short Term Effects of Experimental Burning and Thinning on Soil Respiration in an Old Growth, Mixed Conifer Forest; Univ. of Toledo, OH; Univ. of Calif; Davis and Univ. Metropolitana, San Juan, PR.

Management Guidelines for Soils Derived from Volcanic Ash in the Blue Mountains of Oregon and Washington, Draft of July, 1985, Region 6 Soils Personnel

Matchett, J.R. et.al. 2004. Spatial and Temporal Patterns of Off-Highway Vehicle Use at the Dove Springs OHV Open Area, California. USGS Report prepared for the BLM.

Meadows, D., R. Foltz, and N. Geehan. 2008. Effects of All-Terrain Vehicles on Forested Lands and Grasslands. USDA, Forest Service, National Technology and Development Program, Recreation Management and USDOT, Federal Highway Administration. 0823 1811-SDTDC, December 2008.

Miller, R.F., and Jeffrey A. Rose. 1999. Fire history and western juniper encroachment in sagebrush steppe. Journal of Range Management. 52:550-559.

Monello, R.J. and R.G. Wright. 1999. Amphibian habitat preferences among artificial ponds in the Palouse Region of Northern Idaho. Journal of Herpetology 33:298-303.

Montana State University Extension Service Bulletin. 1992. Controlling Knapweed on Montana Rangeland. Circular 311, February 1992.

Montgomery, D. R. , and J.M. Buffington. 1993. Channel classification, prediction of channel response, and assessment of channel condition. TFW-SH10-93-022. Prepared for the SHAMW committee of the Washington State Timber Fish & Wildlife agreement. Timber Fish & Wildlife, Seattle, Washington.

Morris, R.L., and W.W. Tanner 1969. The ecology of the western spotted frog, Rana pretiosa pretiosa Baird and Girard, a life history study. The Great Basin Naturalist 29:45-81.

Munger, J.C., B. Barnett, and A. Ames. 1997. 1996 Sawtooth Wilderness Amphibian Survey. Report to the US Forest Service.

Nakamura, F. and F.J. Swanson. 1993. Effects of Coarse Woody Debris on Morphology and Sediment Storage of a Mountain Stream System in Western Oregon. Earth Surface processes and Landforms. 18:43-61.

Nedeau, E., A.K. Smith and J. Stone. Freshwater Mussels of the Pacific Northwest.

Nehlsen, Willa PhD. 1995. Historical Salmon and Steelhead Runs of the Upper Deschutes River and Their Environments.

Neitzel and Frest. 1992. Survey of Columbia River Basin Streams for Columbia Pebblesnail Flumimcola colum Mana and Shortface Lanx Fisherola nuttalli.

Newhouse, B. et. al. 1995. Ecology of the Genus Carex in the Eastside Ecosystem Management Area. An unpublished report submitted to the Eastside Ecosystem Management Project, U.S. Forest Service, Walla Walla, WA.

Oregon Biodiversity Information Center. 2010. Updated rare, threatened and endangered plant list (www.orbic.pdx.edu) based on the database of rare plant occurrences in Oregon, Oregon Natural Heritage Program, 2007.

Oregon Department of Environmental Quality (ODEQ). 2010. Oregon's 2010 Integrated Report.

Oregon Department of Fish &Wildlife, 1991. Fish Population Reports - Completed by the Oregon Department of Wildlife. Prineville, OR. 97754.

Oregon Department of Geology and Minerals Industry, 1982, "Geothermal Resources of Oregon", 1:500,000.

Oregon Department of Fish and Game. Stream Survey. Frey, et al. 1978.

Oregon Parks and Recreation Department: ATV's, atv.prd.state.or.us/places.php.

Oregon Parks and Recreation Department. 2009. The official handbook of 2009 OHV Oregon laws and rules. <http://www.oregonOHV.org>.

Oregon State Game Commission. 1957. Annual Report-Fishery Division.

Orr, E.L., W.N. Orr and E.M. Baldwin, 1992, "Geology of Oregon", Kendall Hunt Publishing Company, 254 pg.

Ouren, D.S., C. Haas, C.P. Melcher, S.C. Stewart, P.D. Ponds, N.R. Sexton, L.Burris, T. Fancher, and Z.H. Bowen. 2007. Environmental Effects of Off-Highway Vehicles on Bureau of Land Management Lands: A Literature Synthesis, Annotated Bibliographies, Extensive Bibliographies, and Internet Resources. U.S. Geological Survey, Open-File Report 2007-1353, 225 p.

Pacific Fishery Management Council letter. 2000. Consultation with National Marine Fisheries Service on Federal Actions in Essential Fish Habitat.

Page-Dumroese, D., R.T. Graham and A.E. Harvey; 1991; Soil Organic Matter Effects on Douglas Fir Growth in Northern Idaho Soils.

Patla, D.A., and C.R. Peterson. 1997. Idaho native species accounts: Columbia Spotted Frog. Idaho Herp News 9:7-9.

Paulson, D.J., 1977. "Ochoco National Forest Soil Resource Inventory, Pacific Northwest Region," U. S. Forest Service, Ochoco National Forest.

Pilliod, D.S., C.R. Peterson, and P.I. Ritson. 2002. Seasonal migration of Columbia spotted frogs (Rana luteiventris) among complimentary resources in a high mountain basin. Canadian Journal of Zoology 80: 1849-1862.

Pilliod, D.S.; R. B. Bury, E.J. Hyde, C.A. Pearl and P.S. Corn. 2003. Fire and amphibians in North America. USDA Forest Service, Rocky Mountain Research Station, Aldo Leopold Wilderness Research Institute, Missoula, MT.

Pillsbry, H. 1916. Proceeding of the Academy of Natural Sciences of Philadelphia. Vol. 68, No. 3 (May-Dec., 1916).

Potash, L.L. 1998. Management Recommendations for Mingan moonwort (Botrychium minganense Victorin) v. 2.0. Report for the Northwest Forest Plan. http://www.or.blm.gov/surveyandmanage/MR/VascularPlants/section4.htm

Prose, D.V., S.K. Metzger, and H.G. Wilshire. 1987. Effects of Substrate Disturbance on Secondary Plant Succession, Mojave Desert, California. Journal of Applied Ecology 24: 305-313.

Reaser, J.K., and D.S. Pilliod. 2005 in press. Species Account: Columbia Spotted Frog (Rana luteiventris). In Lannoo M., Status and Conservation of U.S. Amphibian Volume II. University of California Press, Berkeley, Ca.

Richards, B. N; 1987. Introduction to the Soil Ecosystem.

Riegel, Gregg. 2010. Ecologist for the Deschutes, Ochoco, Fremont and Winema National Forests. Personal communication on susceptibility of scabland to invasive annual grasses, September 2, 2010.

Robinson, Paul T., 1975, "Reconnaissance Geologic Map of the John Day Formation in the Southwestern part of the Blue Mountains and Adjacent Areas, North-Central Oregon" USGS, Misc. Geologic Investigations Map I-872.

Rodnick KJ, Gamperl AK, Lizars KR *et al. (*2004*)* Thermal tolerance and metabolic physiology among redband trout populations in south-eastern Oregon. *Journal of Fish Biology,* **64** 310–335.

Rosgen, D. L. 1994. A classification of natural rivers. Catena. 21:169-199.

Rosgen, D. L. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

Rosgen, D. 2009. Watershed Assessment of River Stability and Sediment Supply (WARSSS), Second Edition. Wildand Hydrology, Fort Collins, Colorado.

Sanborn, P; Kranabetter, M; and Bulmer; 1999; Soil Rehabilitation in the Prince George Forest Region: A Review of Two Decades of Research; Forest Research Note, British Columbia Forest Service

Schmidt, Thomas, 1996, "Water Conservation Plan for Ochoco National Forest and Crooked River National Grasslands," U.S. Forest Service, Ochoco National Forest, 8 pg.

Sheley, R. L., B. E. Olson, and C. Hoops. 1998. Impacts of noxious weeds on the ecology and economy of Montana. Montana State University Extension Service Bulletin #152.

Shilling, E. and R. Harrison. 1993. Rock Creek Enduro Sound Tests. 9423 1202. San Dimas, CA: U.S. Department of Agriculture, Forest Service, San Dimas Technology and Development Center. 7 p.

Storck, P., L. Bowling, P. Wetherbee and D. Lettenmaier. 1998. Application of a GIS-based distributed hydrology model for prediction of forest harvest effects on peak stream flow in the Pacific Northwest. Hydrological Processes, Volume 12, p. 889-904.

Swanson, D.A., 1969, "Reconnaissance Geologic Map of the East Half of the Bend Quadrangle, Crook, Wheeler, Jefferson, Wasco and Deschutes Counties, Oregon", USGS, Map I-568.

Swanson and Loomis 1996, Role of Nonmarket Economic Values in Benefit-Cost Analysis of Public Forest Management, General Technical Report PNW-GRT-361

Swinney, C. M., A. C. Waters and C. P. Miller, 1968, "Reconnaissance Geologic Map of the Lookout Mountain Quadrangle, Crook and Wheeler Counties, Oregon", USGS, Misc. Geologic Investigations Map I-543.

Takken, I., J. Croke, and P. Lane. 2008. A methodology to assess the delivery of road runoff in forestry environments. Hydrological Processes, Volume 22, p. 254-264.

Taylor, G. 1997. OSU Extension talk, Prineville, Oregon, January 16, 1997

Taylor, K. and J. Mangold. 2011. Weed Seed Dispersal by Vehicles. Montana State University Extension Bulletin MT201105AG, June 2011.

Tout, D. 1989. "Mineral Potential Report for the Ochoco National Forest", U.S. Forest Service, unpublished, 13 pg.

USDA Forest Service. 1988. General Water Quality Best Management Practices. Pacific Northwest Region. November, 1988.

USDA. Forest Service. 1989. Final Environmental Impact Statement: Land and Resource Management Plan, Ochoco National Forest and Crooked River National Grassland. U.S.D.A. Forest Service, Pacific Northwest Region (August 1989).

USDA Forest Service. 1989a. Land and Resource Management Plan. Part 1. Ochoco National Forest. Reprinted 1991. Prineville, OR.

USDA Forest Service. 1989b. Managing Competing and Unwanted Vegetation Final Environmental Impact Statement. Pacific Northwest Region. Portland, OR.

USDA Forest Service. 1992. Forest Service Manual 2670 Threatened, Endangered, and Sensitive Plants and Animals.

USDA. Forest Service. 1995. Implementation of the Inland Native Fish Strategy letter. Northern Region, Intermountain Region and Pacific Northwest Region.

U.S.D.A. Forest Service. 1995. Inland Native Fish Strategy Environmental Assessment, Decision Notice and Finding of No Significant Impact, Intermountain, Northern and Pacific Northwest Regions.U.S.D.A. Forest Sevice. 2006.

USDA Forest Service. 1995a. Decision Notice for the Revised Continuation of Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales. Region 6: Colville, Deschutes, Fremont, Malheur, Ochoco, Okanogan, Umatilla, Wallowa-Whitman and Winema National Forests in Oregon and Washington. June 5, 1995. Portland, OR.

USDA Forest Service. 1995c. Decision Notice and Finding of No Significant Impact. Inland Native Fish Strategy Environmental Assessment. Intermountain, Northern, and Pacific Northwest Regions. July 28, 1995. Coeur d'Alene, ID.

USDA Forest Service, 1996. Water Conservation Plan for the Ochoco National Forest, May 1, 1996. Prineville, OR.

USDA Forest Service. 1998. Decision Notice and Finding of No Significant Impact, Ochoco National Forest and Crooked River National Grassland Plan Amendment No. 16. Environmental Assessment for the Integrated Noxious Weed Management Program. July 20, 1998. Prineville, OR.

USDA Forest Service. 2005. Preventing and Managing Invasive Plants Final Environmental Impact Statement. Pacific Northwest Region Invasive Plant Program. R6-NR-FHP-PR-02-05.

USDA Forest Service. 2005. Recreation Facility Analysis: Supply, Current Use and Future Demand, Deschutes National Forest. Powerpoint Presentation.

USDA Forest Service. 2006. Burned-Area Report, FS-2500-8, August 14, 2006.

USDA Forest Service. 2006a. Ochoco National Forest Recreation Niche.
http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev3_035625.pdf
http://www.fs.usda.gov/detail/centraloregon/recreation/?cid=fsbdev3_035891

USDA Forest Service. 2006b. Natural Resource Information System –Human Dimensions – National Visitor Use Monitoring, Version 1.5. Ecosystem Management Coordination Staff, Washington, D.C. Computer Software.

USDA Forest Service. 2009c. National Visitor Use Monitoring USDA Natural Resource Conservation Service. 2006. Plants database. http//plants.usda.gov.

U.S.D.A. Maxwell Fire BAER. Forest Service. 2007. Level II stream survey. Ochoco National Forest, Lookout Mountain Ranger District.

USDA Forest Service. 2008. Regional Forester's Sensitive Species List. Unpublished report for the Pacific Northwest Region. http://www.fs.fed.us/r6/sfpnw/issssp/agency-policy/

U.S.D.A. Forest Service. 2009. Deep Creek Watershed Aquatic Habitat Restoration Strategy Plan. Paulina Ranger District, Ochoco National Forest.

USDA Forest Service. 2011. Update to the Regional Forester's Sensitive Species List. Pacific Northwest Region, Portland, Oregon. Regional Forester Kent Connaughton, December 9, 2011. http://www.fs.fed.us/r6/sfpnw/issssp/agency-policy/

USDA Forest Service. 2012. Deschutes/Ochoco National Forests Invasive Plant Treatments Final Supplemental Environmental Impact Statement. Bend, Oregon.

USDA Forest Service Technology and Development Center; 2002, Managing Degraded Off-Highway Vehicle Trails in Wet, Unstable, Sensitive Environments; 0223-2821-MTDC

USDA Northwest Regional Office letter. 2001. Consultation with National Marine Fisheries Service on Federal Actions in Essential Fish Habitat.

USDA/USDI Joint Aquatic and Terrestrial Programmatic Biological Assessment for Federal Lands within the Deschutes and John Day River Basin's Administered by the\Deschutes and Ochoco National Forests. Pp 63-64. August 2001-August 2003.

USDA/USDI Joint Aquatic and Terrestrial Programmatic Biological Assessment for Federal Lands within the Deschutes and John Day River Basin's Administered by the\Deschutes and Ochoco National Forests. August 2006-August 2009.

USDA/USDI. 1999. The Interior Columbia Basin Ecosystem Management Project: Scientific Assessment. US Forest Service and US Bureau of Land Management.

Upper Deschutes River Subbasin Management Plan, Oregon Department of Fish and Wildlife, Upper Deschutes Fish District, October 1996

US Fish and Wildlife Service. 2005. Endangered and Threatened Wildlife and Plants. 50 CFR 17.12.

US Fish and Wildlife Service. 2010. Endangered and Threatened Wildlife and Plants. Updates from website on final and proposed rulings. www.fws.gov.

US Geological Service. 2007. Environmental Effects of Off-Highway Vehicles on Bureau of Land Management Lands: A Literature Synthesis, Annotated Bibliographies, Extensive Bibliographies, and Internet Resources. Open File Report 2007-135.

Walker, D. A., and K. R. Everett. 1987. Road dust and its environmental impact on Alaskan taiga and tundra. Pages 479–489 in K. A. Salzberg, S. Fridriksson and P. J.Webber, editors. Restoration and vegetation succession in circumpolar lands; Proceedings of the Seventh Conference of the Comite´ Arctique International, 7–13 September 1986, Reykjavik, Iceland. Arctic and Alpine Research 19:479–489.

Walker, G.W., editor. 1990. "Geology of the Blue Mountains Region of Oregon, Idaho and Washington: Cenozoic Geology of the Blue Mountains Region", USGS, Professional Paper 1437, 135 pg.

Walker, G.W. and N.S. MacLeod, 1991. "Geologic Map of Oregon", Department of Oregon Geology and Minerals Industry, 1:500,000.

Walker, G.W., N.V. Peterson and R.C. Greene. 1967. “Reconnaissance Geologic Map of the East Half of the Crescent Quadrangle, Lake, Deschutes and Crook Counties, Oregon”, USGS, Misc. Geologic Investigations Map I-493.

Water Resources, Appendix V, Columbia-North Pacific Region Comprehensive Framework Study, Volume 2 (Subregions 7-12), April 1970, prepared by Columbia-North Pacific Technical Staff, Pacific Northwest River Basins Commission, Vancouver, Washington.

Waters, A. C. and R. H. Vaughn, 1968, "Reconnaissance Geologic Map of the Ochoco Reservoir Quadrangle, Crook County, Oregon," USGS, Misc. Geologic Investigations Map I-541.

Webb, R.H. 1982. Off-road motorcycle effects on a desert soil: Environmental Conservation 9(3)197-208.

Webb, R.H., and H.G. Wilshire, editors; 1983. Environmental Effects of Off-Road Vehicles, Impacts and Management in Arid Regions.

Welsh, M. J. 2008. Sediment Production and Delivery from Forest Roads and Off-Highway Vehicle Trails in the Upper South Platte River Watershed, Colorado.

Wemple, B.C., J.A. Jones, and G.E. Grant. 1996. Channel Network Extension by Logging Roads in Two Basins, Western Cascades, Oregon. American Water Resources Association, Water Resources Bulletin, Volume 32, No. 6, p. 1195-1207.

Whisenant, S.G. 1999. Ripairing Damaged Wildlands.

Wilshire, H.G., S. Shipley, and J.K. Nakata. 1978a. Impacts of Off-road Vehicles on Vegetation.

Wilshire, H.G., J.K. Nakata, S. Shipley, and K. Prestegaard. 1978b. Impacts of Vehicles on Natural Terrain at Seven Sites in the San Francisco Bay area. Environmental Geology 2(5):295-319.

Winward, A. 1991. A Renewed Commitment to Management of Sagebrush Grasslands.

Woldie, D.W., R.C. Sidle, and T. Gomi. 2009. Impact of road-generated storm runoff on a small catchment response. Hydrological Processes, Volume 23, p. 3631-3638.

Wydoski, R. S., and R. R. Whitney. 1979. Inland Fishes of Washington.

Zika, P.F. 1992. Draft Management Guide for Rare Botrychium Species for the Mount Hood National Forest. Unpublished report submitted to the Ochoco National Forest. Oregon Natural Heritage Program, Portland, OR.

Zika, Peter F., R. Brainerd and B. Newhouse. 1995. Grapeferns and Moonworts (Botrychium, Ophioglossaceae) in the Columbia Basin. An unpublished report submitted to the Eastside Ecosystem Management Project, U.S. Forest Service, Walla Walla, WA.

Glossary

A

Access Management- Management of the ingress and egress of people on National Forest System lands. Generally used to describe motorized use allowed.

Adaptive Management- A type of natural resource management that implies making decisions as part of an on-going process. Monitoring the results of actions would provide flow of information that may indicate the need to change a curse of action. Scientific findings and the needs of society may also indicate the need to adapt resource management to the new information.

Administrative Use - Motorized use of a road, trail or area for limited administrative use by the Forest Service; use of any fire, military, emergency or law enforcement vehicle for emergency purposes. Authorized use of any combat or combat support vehicles for national defense purposes; Law enforcement response to violations of the law, including pursuit; and, Permitted use and occupancy of National Forest System lands (USDA- Forest Service. 2004. 36 CFR part 212, 251, 261, and 295).

Advanced Regeneration - Small trees, usually less than one inch in diameter, that are growing under mature trees prior to planned harvest activities.

Affected Environment - The natural environment that exists at the present time in an area being analyzed.

Air Shed- A geographical area that, because of topography, meteorology and climate, shares the same air.

All-terrain Vehicle (ATV) - Any motorized, off-highway vehicle 50 inches or less in width, having a dry weight of 600 pounds or less that travels on three or more low-pressure tires with a seat designated to be straddled by the operator. Low-pressure tires are 6 inches or more in width and designed for use on wheel rim diameters of 12 inches or less, utilizing an operating pressure of 10 pounds per square inch (psi) or less as recommended by the vehicle manufacturer (FSH 2309.18). In this document ATV trail is often used to discuss a motorized trail that can be used for motorcycles also.

Class I ATV (quads, 3-wheelers)

- Vehicles 50-inch wide or less and,
- Dry weight of 800 pounds or less
- Has a saddle or seat
- Travels on 3 or more tires

Class II ATV (jeeps, sand rails, SUVs, etc)

- Vehicles wider than 50 inches and
- Dry weight more than 800 pounds

Class III ATV (motorcycles)

- Vehicles on two tires
- Dry weight less than 600 pounds

The Forest Service does not classify as ATVs the new ‘golf cart’ sized light off-road utility vehicles as they usually have a wider track and overall length than ATVs.

Alternative- One of several policies, plans or projects proposed for the decision-making.

Aquatic Ecosystem-The stream channel, lake or estuary bed, water, biotic communities and the habitat features that occur within.

Archaeological- A term used to describe any cultural resources deposited on or in soil strata from past human activities. However, these cultural deposits generally must be at least 50 years old to be considered archaeological.

Area- A discrete, specifically delineated space that is smaller, and in most cases much smaller, than a Ranger District.

Arterial Road- A forest road that provides service to large land areas and usually connects with other arterial roads or public highways. (FSH 7709.54 – Forest Transportation Terminology Handbook, no longer in print).

B

Best Management Practices (BMP)- Practices designed to prevent or reduce water pollution. Also referred to as Soil and Water Conservation Practices (SWCPs).

Big Game- Those species of large mammals normally managed for sport hunting.

Biological Diversity- The number and abundance of species found within a common environment. This includes the variety of genes, species, ecosystems and ecological processes that connect everything in a common environment.

Borrow Source- An area from which sand, gravel or stone is taken for use in another area.

Bridge- A road or trail structure, including supports, erected over a depression or obstruction such as water, a road, trail or railway and having a deck for carrying traffic or other loads.

C

Canopy- the upper most spreading branchy layer of a forest.

Canopy Base Height- The height above the ground of the first canopy layer where the density of the crown mass within the layer is high enough to support vertical movement of a fire. Low canopy base heights have been shown to initiate crown fire behavior.

Capability- The potential of an area of land to produce resources, supply goods and services and to allow resource uses under an assumed set of management practices and at a given level of management intensity. Capability depends on current conditions and site conditions such as climate, slope, landform, soils and geology, as well as the application of management practices, such as silviculture or protection from fire, insects and disease.

Chain- A standard measurement for rate of fire spread (approximately 66')

Classified Road- Road 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 for motor vehicle use pursuant to 36 CFR 212.51 on a Motor Vehicle Use Map (MVUM). (36 CFR 212.1, FSM 7705 - Transportation System). A road under Forest Service jurisdiction.

Clean Air Act -(42 U. S. C. 7609). Section 309 provides authority for the Environmental Protection Agency to review other agency environmental impact statements.

Closed Roads- Roads on the Forest Transportation system available for motorized administrative or emergency use, but not open to public motorized use. Also called long-term intermittent and is classified as a Maintenance Level I road.

Collector Road- A forest road that serves smaller land areas than an arterial road. Usually connects forest arterial roads to local forest roads or terminal (FSH 7709.54- Forest Transportation Terminology Handbook, no longer in print).

Concern- (Also management concern). An issue, problem or condition which constrains the range of management practices identified by the Forest Service in the planning process.

Concentrated Use – The Forest Plan page 4-135 under Intensive Recreation defines concentrated use as: "Generally, high concentrations of visitors will occur around developments."

Condition Classes- A function of the degree of departure from historical fire regimes. Condition Class I is within or near historical conditions; Class III is significantly altered from historical regimes.

Connectivity (of habitats)- The linkage of similar but separated vegetation stands by patches, corridors or 'stepping stone' of like vegetation. This term can also refer to the degree to which similar habitats are linked.

Corridor- Elements of the landscape that connect similar areas. Streamside vegetation may create a corridor of willows and hardwoods between meadows where wildlife feed.

Council of Environmental Quality (CEQ)- The Council issues regulations binding all federal agencies, to implement the procedural provisions of the national Environmental Quality Act (NEPA). The regulations address the administration of the NEPA process, including the preparation of Environmental Impact Statements (EIS) for major federal actions which significantly affect the quality of the human environment.

Cover- Any feature that conceals wildlife or fish. Cover may be dead or live vegetation, boulders or undercut streambanks. Animals use cover to escape from predators, rest or feed.

Cross-country Travel- Travel over terrain not on designated roads and/or trails.

Cultural Resource- An umbrella term used to describe a variety of resources, including archaeological or historic remains, folklore and oral traditions and geographic areas traditionally ascribed to have historical significance to a given culture.

Cumulative Effects or Impacts- The impact on the environment that results from incremental impact of an action when added to other past, present and reasonably foreseeable future actions regardless of what agency or person undertakes such other action. Cumulative effects or impacts can result from individual minor but collectively significant actions taking place over a period of time.

D

Draft Environmental Impact Statement (DEIS) - The draft version of the Environmental Impact Statement that is released to the public and other agencies for review and comment.

Designated road, trail or area- A National Forest System road, a National Forest System trail, or an area on National Forest System lands that is designated for motor vehicle use pursuant to §212.51 on a motor vehicle use map.

Detrimental Soil Disturbance- Compacted, displaced, eroded or burned soil conditions incurred by management, recreational or natural activities that are capable of reducing the productivity of the soil resource.

Developed Recreation- Recreation that requires facilities that, in turn, result in concentrated use of the area. The Forest Plan on page G-4 defines developed recreation: "Recreation use that occurs within a site or facility specifically established and constructed for public recreation

purposes. Activities commonly included are camping, picnicking, resort use, downhill skiing, but also include parking areas, trailheads, boat launching sites, etc.

Difficulty Level - The degree of challenge a trail presents to an average user's physical ability and skill, based on trail condition and route location factors such as alignment, steepness of grades, gain and loss of elevation, and amount and kind of natural barriers that must be crossed, and which may temporarily change due to weather. (FSM 2353.05):

a. Easiest. A trail requiring limited physical ability and skill to travel.

b. More Difficult. A trail requiring some physical ability and skill to travel.

c. Most Difficult. A trail requiring a high degree of physical ability and skill to travel.

Dispersed Recreation- Recreation with few developed amenities such as structures, developed campsites or toilets. Dispersed recreation is generally less directly constrained by management controls on movement or by enforcement activities, but must comply with posted orders or restrictions for areas under management. Dispersed campers for instance, can choose to camp in places that are underdeveloped, so long as they meet the general posted rules for site protection. The term dispersed recreation usually implies lower visitor use densities. Dispersed recreation may be motorized or non-motorized and that is defined in the Forest Plan on page 4-4: "Activities which disperse recreation throughout the forest include Nordic skiing, river rafting, mountain bicycling, and off-highwau use." Page G-4 of the Forest Plan defines dispersed recreation as "Recreation use outside of developed recreation site, ranging from scenic driving to backpacking."

Disturbance- Events that such as a forest fire or insect infestation that alters stand structure composition or function of an ecosystem.

Dual Sport-Class III (motorcycle) ATV specificially designed to be street legal and used off road.

E

Early Seral- Plants which inhabit a disturbed site within the first few years subsequent to the disturbance.

Ecosystem- An arrangement of living and nonliving things and the forces that move among them. Living things include plants and animals. Non-living parts of ecosystems may be rocks and minerals. Weather and wildfire are two of the forces that act within ecosystems.

Effects- Environmental consequences as a result of a proposed action. Included are direct effects, which are caused by the action and occur at the same time and place, and indirect effects, which are caused by the action and are later in time or further removed in distance, but which are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate and related effects on air, water and other natural systems including ecosystems.

Emergency Need- An urgent maintenance need that may result in injury, illness, or loss of life, natural resource or property; and must be satisfied immediately. Emergency needs generally require a declaration of emergency or disaster, or a finding by a line office that an emergency exists.

Endangered Species-Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior and endangered in accordance with the 1973 Endangered Species Act.

Endangered Species Act- The Act which requires consultation with U.S. Fish and Wildlife Service if practices on National Forest System lands may impact a threatened or endangered plant or animal species.

Engineering Analysis- An analysis and evaluation conducted by a qualified engineer or under the supervision of a qualified engineer of a NFS road, road segment or road being considered for mixed motorized use. The analysis and evaluation may include recommended mitigation measures. The analysis may simply be simply documentation of engineering judgment or maybe a more complex engineering report that includes many factors related to mixed motorized use.

Environmental Analysis- An analysis of alternative actions and their predictable long and short-term effects. Environmental analysis include physical, biological, social and economic factors.

Environmental Impact Statement (EIS)- A statement of the environmental effects of a proposed action and alternatives to it. It is required for major federal actions under Section 102 of the National Environmental Policy Act (NEPA) of 1969 and released to the public and other agencies for comment and review. It is a formal document that must follow the requirements of NEPA, the Council for Environmental Quality (CEQ) guidelines and directives of the agency responsible for the project proposal.

F

Facilities- Transportation planning, road management and operation, fleet equipment and engineering services (for example: administrative buildings, water and sanitation systems, sanitary landfills, dams, bridges and communication systems).

Fauna- The animal life of an area.

Fugitive Dust- Dust generated from open sources is termed ‘fugitive’ because it is not discharged to the atmosphere in a confined flow stream.

Fire Management- All activities required for the protection of resources from fire and the use of fire to meet land management goals and objectives.

Fire regime- A function of the historical frequency of fire and the degree of severity of those fires.

Flood Plain- A lowland adjoining a watercourse. At a minimum the area is subject to a 1% or greater chance of flooding in a given year.

Forage- All browse and non-woody plants that are eaten by wildlife or livestock.

Forb- A broadleaf plant that has little or no woody material in it.

Forest Road or Trail- A road or trail 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.

Forest Supervisor- The official responsible for administering National Forest lands on an administrative unit, usually consisting of one or more Ranger Districts which comprise the National Forest. The Forest Supervisor reports to the Regional Forester.

Fuels- Vegetative matter, dead or alive, that burns in a fire. It is broadly categorized by the following categories:

- Surface or ground fuels are within a foot of the ground.
- Ladder fuels exist when you have a continuous vertical arrangement of fuel that easily allows fire to go from ground level into the tree canopy.

- Crown fuels are the tree limbs and leaves that can burn with enough heat and/or wind.
- Live fuels are the green (live) herbs and shrubs.

Fuel Models- Fuel models are a tool used to standardize discussion of fuel conditions on a landscape.

Fuel conditions, defined by quantity and arrangement, have been categorized into 40 standard descriptive fuel models (Scott and Burgan 2005).

Fuel Treatment- Manipulation or removal of fuels to reduce the likelihood of ignition and/or lessen potential damage and resistance to control (e.g. lopping, pruning, chipping, crushing, mastication, piling and burning).

G

Game Species- Any species of wildlife or fish that is harvested according to prescribed limits and seasons.

Geographical Information Systems (GIS)- GIS is a computer technology that uses a geographic information system as an analytic framework for managing and integrating date, solving a problem or understanding a past, present or future situation.

H

Habitat- The area where a plant or animal lives and grows under natural conditions.

Habitat Capacity- The ability of a land area or plant community to support a given species of wildlife.

Hiding Cover- The vegetation that would hide ninety percent of an elk from the view of a human at a distance of 200 feet or less. The distance which the animal is essentially hidden is called sight distance.

High Clearance Vehicle- Generally a truck, pickup truck, SUV or ATV with a road clearance that allows travel on low standard roads without vehicle damage. Usually greater clearance than a standard passenger vehicle.

Highway Legal Vehicle- Any motor vehicle that is licensed or certified under state law for general operation on all public roads in the state. Operators of highway-legal vehicles are subject to state traffic law including requirements for operating licensing.

Historic Property- Any prehistoric or historic district, site, building, structure or object included in, or eligible for inclusion in, the National Register for Historic Places. This term includes artifacts, records and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register for Historic Places criteria.

Hydrology- The science of dealing with the study of water on the surface of the land, in the soil and underlying rocks and in the atmosphere.

I

Initial Attack- The fire suppression effort that takes place as soon as possible following a wildland fire report.

Interdisciplinary Team- A team of individuals with skills from different disciplines that focuses on the same task or project.

Intermittent Stream- A stream that goes dry at some point each year but flows continuously at least 30 days a year when it received water, usually from a seasonal groundwater, but may also include some surface source more persistent than a rainstorm, such as melting snow.

Invasive Species- A plant species moving into areas outside of its former range.

Inventoried Roadless Area- (West of the 100th meridian). An area which meets the statutory definition of wilderness, does not contain improved roads maintained for travel by standard passenger type vehicle and meets one or more of the following criteria:

1. Contains 5,000 acres or more
2. Contains less than 5,000 acres but:

a. Due to physiography or vegetation, is manageable in a natural condition

b. Is a self-contained ecosystem such as an island

c. Is contiguous to existing wilderness, primitive area, Administration-endorsed wilderness or roadless area in other Federal ownership, regardless of size.

Irretrievable- Applies to losses of production, harvest or commitment of renewable natural resources. For example, some of the timber production from an area is irretrievably lost during the time an area is used as a winter sports site. If the use I changed, the timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

Irreversible- Applies primarily to the use of non-renewable resources, such as minerals or cultural resources or to those factors that are renewable only over long time spans, such as soil productivity. Irreversible also includes loss of future options.

Issue- A point, matter or question of public discussion or interest to be addressed or decided through the planning process. *Preliminary issue* is an issue identified early in the scoping phase and is sometimes referred to as a tentative issue. *Significant issue* is an issue within the scope of the proposed action which is used to formulate alternatives in an Environmental Assessment (EA) or Environmental Impact Statement (EIS).

L

Ladder Fuels - Fuels that provide vertical continuity between the ground fuels and tree crowns, thus creating a pathway for the surface fire to move into the overstory tree crowns.

Legal Notice- A notice of a decision which can be appealed that is published in the Federal Register or in the legal notice section of a newspaper or general circulation.

Lek- An area used habitually by grouse species where the males display for the females each spring. Number of males are counted on the lek each spring to estimate general population trends.

M

Maintenance Level- Defines the level of service provided by and maintenance required for a specific road, consistent with road management objectives and maintenance criteria. (FSH 7709.58, Sec 12.3- Transportation System Maintenance Handbook).

Maintenance Level 1- Assigned to intermittent service roads during times they are closed to vehicular traffic. The closure period must exceed one year. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and perpetuate the road to facilitate future management activities. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic maintenance strategies are ‘prohibit’ and ‘eliminate’. Roads receiving level 1 maintenance

may be of any type, class or construction standard and may be managed at any other maintenance level during the time they are open for traffic. However, while being maintained at level 1, they are closed to vehicular traffic, but maybe open and suitable for non-motorized uses.

Maintenance Level 2- Assigned to roads open for se by high clearance vehicles. Passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation or other specialized uses. Log haul may occur at this level. Appropriate traffic management strategies are either: 1) discourage or prohibit passenger cars or 2) accept or discourage high clearance vehicles.

Maintenance Level 3- Assigned to roads open and maintained for travel by prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Roads in this maintenance level are typically low speed, single lane with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material. Appropriate traffic management strategies are either 'encourage' or 'accept'. 'Discourage' or 'prohibit' strategies maybe employed for certain class of vehicles or users.

Maintenance Level 4- Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surface. However, some roads maybe single lane. Some roads maybe paved and/or dust abated. The most appropriate traffic management strategy is 'encourage'. However, 'prohibit' strategy may be apply to specific classes of vehicles or users at certain times.

Maintenance Level 5- Assigned to roads that provide a high degree of user comfort and convenience. Normally, roads are double lane, paved facilities. Some maybe aggregate surfaced and dust abated. The most appropriate traffic management strategy is 'encourage'.

Mitigation Measures- Modifications of actions taken to:

1. Avoid impacts by not taking a certain action or parts of an action,
2. Minimize impacts by limiting the degree or magnitude of the action and its implementation;
3. Rectify impacts by repairing, rehabilitating or restoring the affected environment;
4. Reduce or eliminate impacts over time by preservation and maintenance operations during the life of the action; or,
5. Compensate for impacts by replacing or providing substitute resources or environments.

Mixed Use – Roads on which both highway legal and non-highway legal vehicles are operating.

Monitoring- A process of collecting information to evaluate if objectives and anticipated or assumed results of a management plan are being realized or if implementation is proceeding as planned.

Motor vehicle - Any vehicle which is self-propelled, other than: (1) a vehicle operated on rails; and (2) any wheelchair or mobility device, including one that is batter-powered, that is designed solely for use by a mobility-impaired person for locomotion, and that is suitable for use in an indoor pedestrian area.

Motor vehicle use map (MVUM)- A map reflecting designated roads, trails, and areas on an administrative unit or a Ranger District of the National Forest System.

Motorized Mixed Use- Designation of a national Forest System (NFS) road for use by both highway-legal and non-highway legal motor vehicles (FSM Engineering 7700-30).

Motorized Trail-A route over 50 inches in width or a route over 50 inches wide that is identified and managed as a trail.

N

National Environmental Policy Act (NEPA)- An Act passed in 1969 to declare a national policy that encourages productive and enjoyable harmony between humankind and the environment, promotes efforts that prevent or eliminate damage to the environment and biosphere, stimulates the health and welfare of humanity, enriches the understanding of the ecological systems and natural resources important to the nation, establishes a Council on Environmental Quality.

National Forest Management Act- A law passed in 1976as an amendment to the Forest and Rangeland Renewable Resources Planning Act, requiring preparation of Forest Plans and the preparation of regulations to guide that development.

National Forest System- All National Forest land reserved or withdrawn from the public domain of the U.S.; all National Forest lands acquired through purchase, exchange, donation or other means; the national Grasslands and land utilization projects administered under Title III of the Bankhead-Jones Farm Tenant Act; and all other lands. Waters, interests therein that are administered by the Forest Service or are designated for administration though the Forest Service as part of the system (36 CFR 212.1).

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

National Historic Preservation Act- Legislation intended to preserve historical and archaeological sites in the United States of America. Signed into law October 15, 1966.

National Survey on Recreation and the Environment (NSRE) - Part of the National Recreation Survey (NRS) program that was started in 1960

National Forest Visitor Use Monitoring (NUVM) - A permanent, ongoing sampling system which measures national forest visitor demographics, experiences, preferences and impressions. A stratified random sample is done for 25% of the national Forest system each year according to a national research protocol. NVUM responds to the need to better understand the use and importance, satisfaction with, national forest recreation opportunities.

National Register of Historic Places- A register of districts, sites, buildings, structures and objects significant in American history, architecture, archaeology and culture. The register was established by the National Historic Preservation Act of 1966 and is maintained by the Secretary of the Interior.

Native Species- With respect to a particular ecosystem, a species that other than as a result of introduction, historically occurred or currently occurs in that ecosystem (Executive Order 13122, 2/3/99).

Non-Motorized Travel- Modes of travel include hiking, equestrian and mountain bikes and exclude all motorized use.

Noxious Weeds (Invasive species)- Non-native plants listed by the State that generally have either economic or ecosystem impacts, or are poisonous to wildlife and/or livestock. They aggressively invade disturbed areas such as fires, road slides, landslides and construction areas.

O

Off-highway vehicle (OHV) - Any motor vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland, or other natural terrain.

Off-road Vehicle (ORV) - Any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, snow, ice or other natural terrain.

Operation Permit - Sticker placed on an OHV that allows access to public lands in designated areas in the State of Oregon.

Over-snow vehicle - A motor vehicle that is designed for use over snow and that runs on a track or tracks and/or a ski or skis, while in use over snow.

P

Perennial - A plant species having a life span of more than two years.

Percentile Weather- The weather conditions that can be expected of X% of days during the fire season. The standard percents are Low (0%-15%), Moderate (16%-89%), High (90%- 96%) and Extreme (97% +). So low percentile weather is the average suite of weather conditions that would occur less than 15% of the time.

Play Area – limited area allowing for cross-country travel.

Prescribed Fire - Fire which is planned and used as a tool to meet specific management objectives.

Problem Fire- problem fires are wildfires that, because of extreme fire behavior, present a high risk to human safety and loss of forest resources

Project Design Criteria (PDC)- A set of required, implementation design criteria applied to projects to ensure that the project is done according to environmental standards ad adverse effects are within the scope of those predicted in this environmental impact statement.

Proposed Species- Any plant or animal species that is proposed by the Fish and Wildlife Service or NOAA Fisheries in the *Federal Register* notice to be listed as threatened or endangered.

R

Ranger District- An administrative subdivision of a national forest, supervised by a district ranger who reports to the forest supervisor.

Reserved Rights- Rights tribes kept, or reserved during the treaty-making out of a greater number of rights they already owned.

Resolved Issue- Significant issues identified by the public that have been fully mitigated during the development of alternatives or project design criteria.

Restoration- Ecological restoration is the process of assisting the recovery and management of ecological integrity. Ecological integrity includes a critical range of variability in biodiversity ecological processes and structures, regional and historical context and sustainable cultural practices.

Revegetation- The re-establishment of plants on a site. The term does not imply native or nonnative; does not imply that the site can ever support any other types of plants or species and is not at all concerned with how the site ‘functions’ as an ecosystem.

Rill - A narrow and shallow incision into soil resulting from erosion by overland flow that has been focused into a thin thread by soil surface roughness.

Right-of-Way- An accurately located strip of land with defined width, beginning of point and point of ending. It is the area within which the user has the authority to conduct operations approved or granted by the landowner in an authorizing document, such as a permit, easement, lease, license or Memorandum of Understanding (MOU).

Riparian Area- A geographic area containing an aquatic ecosystem and adjacent upland areas that directly affect it.

Road - A motor vehicle route over 50 inches wide, unless identified and managed as a trail.

Road Maintenance- Maintaining or keeping an existing constructed road in an acceptable condition so as to continue to provide acceptable service and achieve its expected life (FSM 7712.3).

Road Maintenance Objective- defines the intended purpose of an individual road based on management area direction and access management objectives, Road management objectives contain design criteria, operations criteria and maintenance criteria (FSH 7709.55 Sec 33-Transportation Planning Handbook).

Rock Crawler – Class II ATV (jeeps, other 4-wheel drive vehicles) specifically designed to climb over rocks and boulders.

S

Saddle Time- Total time spend riding by an OHV recreationist- usually in one day.

Scenic- Of or relating to landscape scenery; pertaining to natural or natural-appearing scenery; constituting or affording pleasant views of natural landscape attributes or positive cultural elements.

Scenic Integrity- State of naturalness, or conversely, the state of disturbance created by human activities or alteration. Integrity is stated in degrees of deviation from existing landscape character in a National Forest.

Scenic Quality- the essential attributes of landscape that when viewed by people elicit psychological and physiological benefits to individuals and society as a whole.

Scenic River- A classification within the national Wild and Scenic River System. Scenic rivers are those rivers, or sections of rivers, that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible by roads.

Seasonal Closures- A route or area closed part of the year. The season of closure is defined by the reason for the closure (e.g. winter range, snow etc.).

Sediment- Any material carried in suspension by water that would ultimately settle to the bottom. Sediment has two main sources: from the channel area itself and from disturbed sites.

Sensitive Species- Species identified by the Regional Forester for which population variability is a concern, as evidenced by significant current or predicted downward trend in population numbers or density; or significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Seral Stages- Seral stages describe the phase of development of a plant community. Early seral species are those species you would expect to find on a site soon after a major disturbance, like fire. These are species such as pines, Douglas-fir, snowbrush, fireweed etc. They are generally shade intolerant species. Late seral are the species under a fully developed vegetative canopy, such as true firs, prince's pine, lichens etc.

Shared use- Shared use roads are those roads on which both highway legal and non-highway legal vehicles are operating and have been specifically identified and designated in the Three Trails OHV trail system.

Silviculture- The theory and practice of directing forest establishment, composition and growth for the production of forest resources to meet specific management objectives.

Site- A specific location where management activity is considered, planned or operating.

Site preparation- The removing or rearranging of vegetation or woody debris to meet specific management objectives. Most often it is used to describe the process(s) used to expose mineral soil areas suitable for planting or seeding desirable species of plants.

State Historic Preservation Office- Established in 1967 to manage and administer programs for the protection of the state's historic and cultural resources.

T

Trail - A route 50 inches or less in width or a route over 50 inches wide that is identified and managed as a trail.

Trail Definitions by Width –

Single track motorcycle trail- width of 6-24 inches

ATV Trail – width of 50 inches or less

Jeep Trail – width of 80 inches or less

Trail Difficulty Level- The degree of challenge a trail presents to an average user's physical ability and skill, based on trail condition and route location factors such as alignment, steepness of grades, gain and elevation, and amount and kind of natural barriers that must be crossed, and which may temporarily change due to weather.

a. Easiest: A trail requiring limited physical ability and skill to travel.

b. More Difficult: A trail requiring some physical ability and skill to travel.

c. Most Difficult: A trail requiring a high degree of physical ability and skill to travel.

Travel Management Rule of 11/2/2005 (36 CFR parts 212, 251, 261 and 295)- Regulations that directs each national forest in the country to designate roads, trails and areas that would be open to motor vehicle use by vehicle class. The result of this process would be a standardized map which designates roads and trails that are open to motorized use. After a map is produced all other areas are closed to motorized use. The map would be updated annually. (*Referred to as the Final Travel Management Rule).*

Tribe- term used to designate a federally-recognized group of American Indians and their governing body. Tribes may be comprised of one or more Band.

Tribal and Treaty Rights- Native American treaty or other rights or interests recognized by treaties, statutes, laws, executive orders, or other government action, or federal court decisions.

Treaty- A contract or compact between nations. It is an agreement that is binding upon nations that sign the treaty.

U

Unauthorized Road or Trail- A road or trail that is not a Forest System road or trail or a temporary road or trail and that is not included in a Forest Transportation Atlas (36 CFR 212.1). The term 'unclassified' was used in some of the earlier project file documentation that predated the Travel Management Rule.

Undesignated Road or Trail- Roads and trails that have not yet gone through site-specific travel planning to determine if they should be open, closed or restricted to motorized vehicle use, or roads and trails that have gone through travel planning and determined that motorized vehicle use is not appropriate and is not allowed.

U.S. Fish and Wildlife Service (USFWS)- The federal agency that is the listing authority for species other than marine mammals and anadromous fish under the ESA.

U.S. Forest Service (USDA FS or USFS)- The federal agency responsible for management of the nation's National Forest lands.

Underburn- Using prescribed fire under the canopy of an existing stand of trees.

V

Viability- Ability of a wildlife or plant population to maintain sufficient size to persist over time in spite of normal fluctuations in numbers**,** usually expressed as a probability of maintaining a specific population for a specified period.

Viable Population- A wildlife or plant population that contains an adequate number of reproductive individuals appropriately distributed on a planning area to ensure long-term existence of the species.

Viewshed- Total visible area from a single observer position, or total visible area from multiple observer positions. Viewsheds are accumulated seen-areas from highways, trails, campgrounds, towns, cities or other viewer locations. Examples are: corridor, feature or basin Viewsheds.

Visual Quality Objective- A desired level of excellence based on physical and sociological characteristics of an area. Refers to the degree of acceptable alteration of the characteristic landscape.

W

Watershed- A land area that contributes all its water to one drainage system, basin, stream or river. Watersheds can be described at multiple levels.

Wetland- An area that is regularly saturated by surface or ground water and subsequently is characterized by a prevalence of vegetation that is adapted for life in saturated soil conditions. Examples include: swamps, bogs, fens, marshes and estuaries.

Wild and Scenic River System- The Wild and Scenic Rivers Act of 1968 established a system of selected rivers in the United States, which possess outstanding remarkable values, to be preserved in a free-flowing condition. Within the national system of rivers, three classifications define the general character of designated rivers: Wild, Scenic and Recreational. Classifications reflect levels of development and natural conditions along a stretch of river. Classifications are used to help develop management goals for the river.

Wilderness- Areas designated by Congressional action under the 1964 Wilderness Act. Wilderness is defined as undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or for a primitive and confined type of recreation; including at least 5,000 acres, or are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, educational, scenic, or historical value as well as ecological and geologic interest.

Wildland Fire- Any non-structure fire that occurs in the wildland. There are three types of wildland fire: wildfire, wildland fire use and prescribed fire.

Wildfire- An unplanned, unwanted wildland fire, including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland ire where the objective is to put the fire out.

Winter Range- A range, usually at lower elevation, used by migratory deer and elk during the winter months; usually better defined and smaller than summer range.

Woody Debris- Dead pieces of woody vegetation such as stems, limbs or leaves which are on a site.

X

Xeric- A soil moisture regime in which soil is dry for 45 or more consecutive days in the 4 months following the summer solstice, and moist for 45 or more consecutive days in the 4 months following the winter solstice.

Index

B

Bald Eagle, xviii, 5, 30, 34, 241, 243, 244, 253, 255, 283, 288
Best Management Practices, xvii, 28, 33, 105, 107, 377, 392, 396
Big Game (Deer and Elk), xv, xvi, xviii, 4, 6, 9, 10, 24, 31, 34, 38, 44, 45, 53, 69, 95, 102, 146, 189, 192, 233, 236, 238, 255, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 287, 294, 304, 331, 364, 373, 374, 378,384, 400, 407

C

Clean Air Act, 354, 355, 356, 396
Clean Water Act, 105, 106, 107, 108, 133, 147, 161, 377
Climate Change/Carbon Cycling, 88, 95, 313, 316, 317, 333, 354, 356, 357, 395, 396
COHVOPS, xix, 25, 35, 67, 358, 375, 382
Connective Corridors, 52, 65, 71, 90, 116, 126, 127, 128, 129, 130, 131, 138, 146, 157, 160, 176, 177, 178, 181, 195, 202, 232

D

Design Elements, xvii, xix, 25, 32, 33, 34, 35, 247, 319, 348

E

Emissions, 79, 313, 316, 317, 354, 355, 356, 357, 358, 359, 373
Executive Order
13112, 321

F

Fugitive dust, 356, 357, 358, 359, 374
Fugitive Dust, 355, 359, 399

H

Hardwoods, 189, 194, 329, 330, 333, 397

I

Inland Native Fish Strategy (INFISH), xvii, 3, 5, 6, 27, 33, 102, 105, 108, 109, 110, 112, 116, 132, 147, 161, 188, 192, 203, 205, 214, 221, 229, 377, 392
Invasive Plant Species, xvii, 29, 34, 42, 90, 91, 93, 304, 310, 312, 315, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 332, 336, 338, 348, 352, 368, 372, 391

J

Juniper, 84, 90, 175, 239, 240, 255, 262, 284, 285, 288, 299, 302, 306, 307, 318, 331, 338, 389

L

Livestock, 8, 25, 26, 31, 32, 43, 44, 45, 79, 100, 102, 104, 174, 178, 180, 187, 188, 189, 190, 192, 194, 197, 228, 230, 252, 302, 309, 320, 331, 340, 341, 345, 346, 347, 348, 349, 352, 360, 361, 370, 373, 399, 403

M

Management Indicator Species, 229, 230, 232, 246, 248, 254, 255, 259, 262, 265, 282, 284, 285, 288, 291, 292, 297
Monitoring, xvii, xviii, xix, 6, 7, 33, 34, 35, 36, 67, 87, 103, 107, 194, 218, 243, 244, 283, 345, 348, 349, 368, 374, 375, 379
Mycorrhizal Fungi, 311

N

Northern Goshawk, xv, xviii, 30, 34, 38, 233, 288, 289, 291, 293, 294, 295
Noxious Weed Act, 320

O

Old Growth Management Area, vii, x, xi, xiv, xvi, 4, 16, 19, 23, 24, 38, 260, 376, 377
Oregon Spotted Frog, xvi, 185, 186, 188, 190, 191, 192, 194, 195, 196, 197, 199, 200, 201, 202, 205, 206, 214, 217, 221, 222, 223, 224, 229, 240, 386, 389, 390

P

Public Involvement, 380
Purpose and Need, 1, 2, 36, 146, 159

Q

Quiet Recreation, iii, xix, 3, 4, 11, 12, 26, 29, 35, 42, 45, 64, 67, 68, 69, 72, 74, 75, 78, 79, 84, 85, 86, 88, 102, 103, 129, 130, 176, 188, 235, 245, 267, 269, 293, 294, 306, 310, 311, 312, 314, 315, 323, 325, 328, 329, 332, 334, 338, 348, 364, 373, 374, 397, 403

R

Riparian, 3

Riparian Habitat Conservation Areas (RHCAs), xv, xvi, xvii, 3, 5, 6, 10, 11, 27, 34, 36, 38, 42, 43, 44, 100, 101, 102, 103, 105, 106, 107, 108, 109, 110, 111, 112, 113, 116, 120, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 134, 135, 136, 138, 139, 141, 142, 144, 145, 147, 150, 151, 152,153, 154, 155, 157, 158, 160, 161, 162, 163, 164, 166, 167, 169, 170, 172, 173, 174, 175, 176, 179, 180, 181, 182, 186, 188, 189, 191, 192, 194, 196, 197, 198, 199, 201, 203, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 217, 218, 219, 220, 221, 222, 224, 226, 227, 228, 229, 230, 235, 239, 242, 245, 246, 250, 256, 264, 274, 276, 279, 280, 290, 293, 297, 301, 302, 303, 304, 305, 307, 308, 309, 311, 312, 313, 314, 316, 317, 318, 323, 329, 330, 332, 348, 372, 379, 385, 388, 392, 404
Road Density, 9, 10, 47, 49, 51, 57, 58, 59, 60, 116, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 135, 145, 163, 177, 178, 179, 180, 204, 265, 266, 272, 277

S

Sensitive Species, 240, 305, 311
Soils, 368
Sound, viii, xvi, xix, 35, 78, 79, 87, 236, 237, 238, 344, 347, 373, 375, 388, 391

T

Travel Management, iii, iv, v, viii, ix, x, xi, xiv, xviii, 1, 2, 7, 12, 13, 14, 17, 18, 19, 20, 23, 26, 31, 34, 36, 42, 43, 52, 56, 61, 66, 71, 72, 74, 79, 90, 93, 102, 129, 130, 132, 146, 147, 160, 175, 176, 196, 197, 198, 201, 216, 234, 253, 258, 272, 274, 276, 278, 279, 280, 281, 293, 294, 295, 303, 319, 323, 328, 342, 348, 352, 357, 359, 370, 371, 374, 375, 376, 378, 379, 380, 405, 406

U

Unroaded Areas, 69, 179, 249, 353, 374, 379, 400
User-created, iii, viii, 12, 42, 48, 52, 71, 76, 84, 85, 86, 130, 131, 132, 135, 136, 139, 141, 142, 145, 146, 147, 150, 151, 153, 154, 155, 158, 159, 160, 161, 163, 164, 167, 169, 170, 173, 174, 178, 180, 181, 195, 197, 201, 216, 234, 250, 257, 268, 271, 272, 273, 275, 277, 279, 294, 295, 309, 310, 332, 342, 343, 348, 357

V

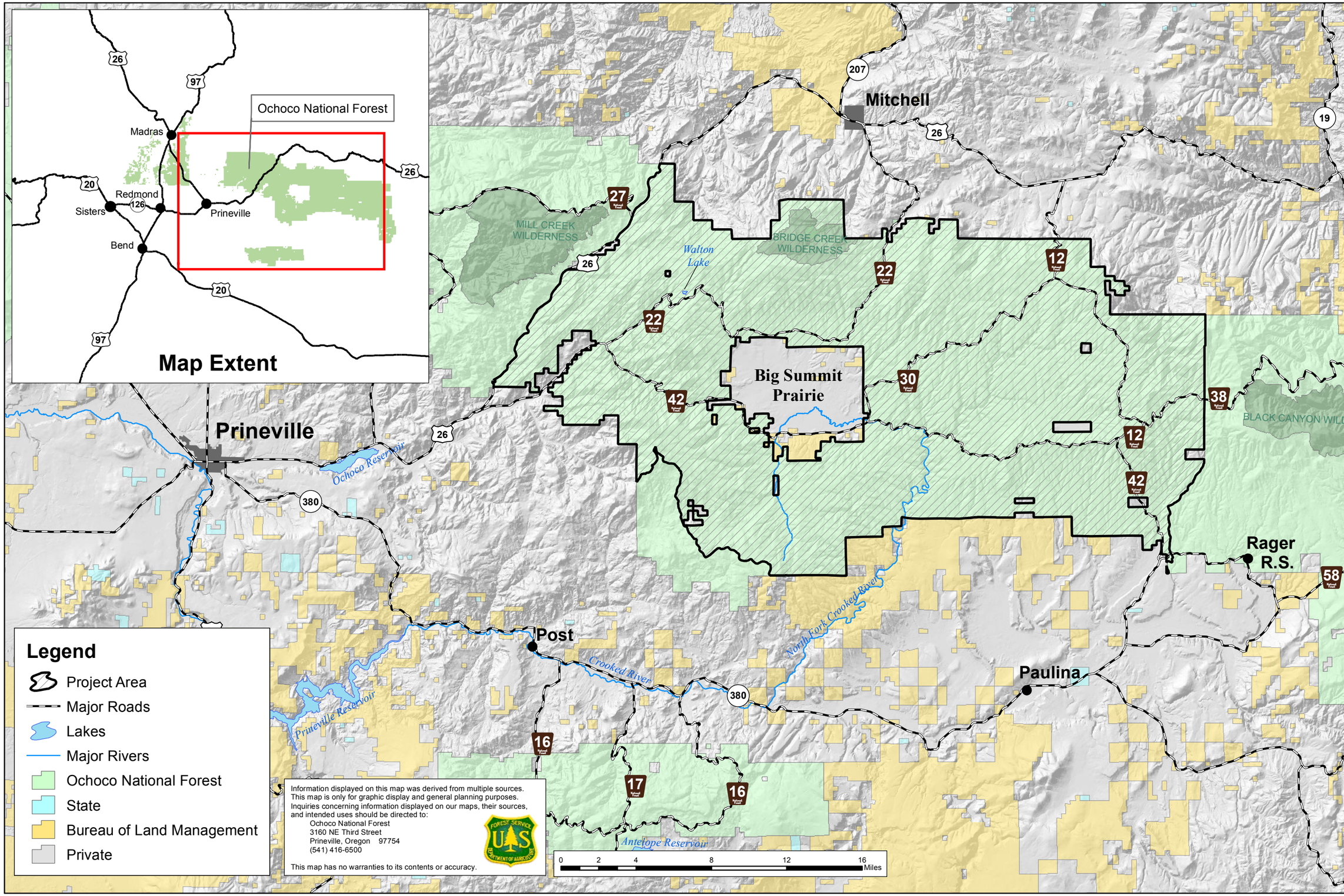
Vehicle Class, 6, 25, 54, 55, 56, 70, 75, 76, 81, 84, 85, 86, 91, 93, 101, 102, 349, 350, 369, 375, 405

W

Water Quality, xvii, 5, 6, 10, 17, 25, 27, 34, 43, 69, 94, 105, 106, 108, 110, 111, 112, 115, 130, 131, 132, 133, 135, 136, 141, 146, 147, 148, 150, 151, 153, 155, 158, 159, 160, 161, 162, 174, 188, 191, 192, 195, 197, 200, 207, 210, 218, 221, 227, 313, 316, 317, 359, 367, 369, 372, 374, 377
Wilderness, 4, 11, 48, 69, 73, 78, 80, 87, 103, 179, 234, 248, 249, 250, 257, 332, 353, 354, 364, 373, 374, 375, 378, 379, 384, 389, 390, 400, 406
Woodpeckers, xvi, xviii, 4, 34, 38, 241, 245, 246, 247, 253, 254, 255, 256, 257, 258, 259, 260, 261, 297

APPENDIX A – MAPS

- Map 1 – Ochoco Summit Trail System Project Area
- Map 2 – Forest Plan Management Areas
- Map 3 – Alternative 2 (Proposed Action) – East Side
- Map 4 – Alternative 2 (Proposed Action) – West Side
- Map 5 – Alternative 3 – East Side
- Map 6 – Alternative 3 – West Side
- Map 7 – Alternative 4 – East Side
- Map 8 – Alternative 5 – West Side
- Map 9 – Watershed Boundaries
- Map 10 – Riparian Habitat Conservation Areas (RHCAs)



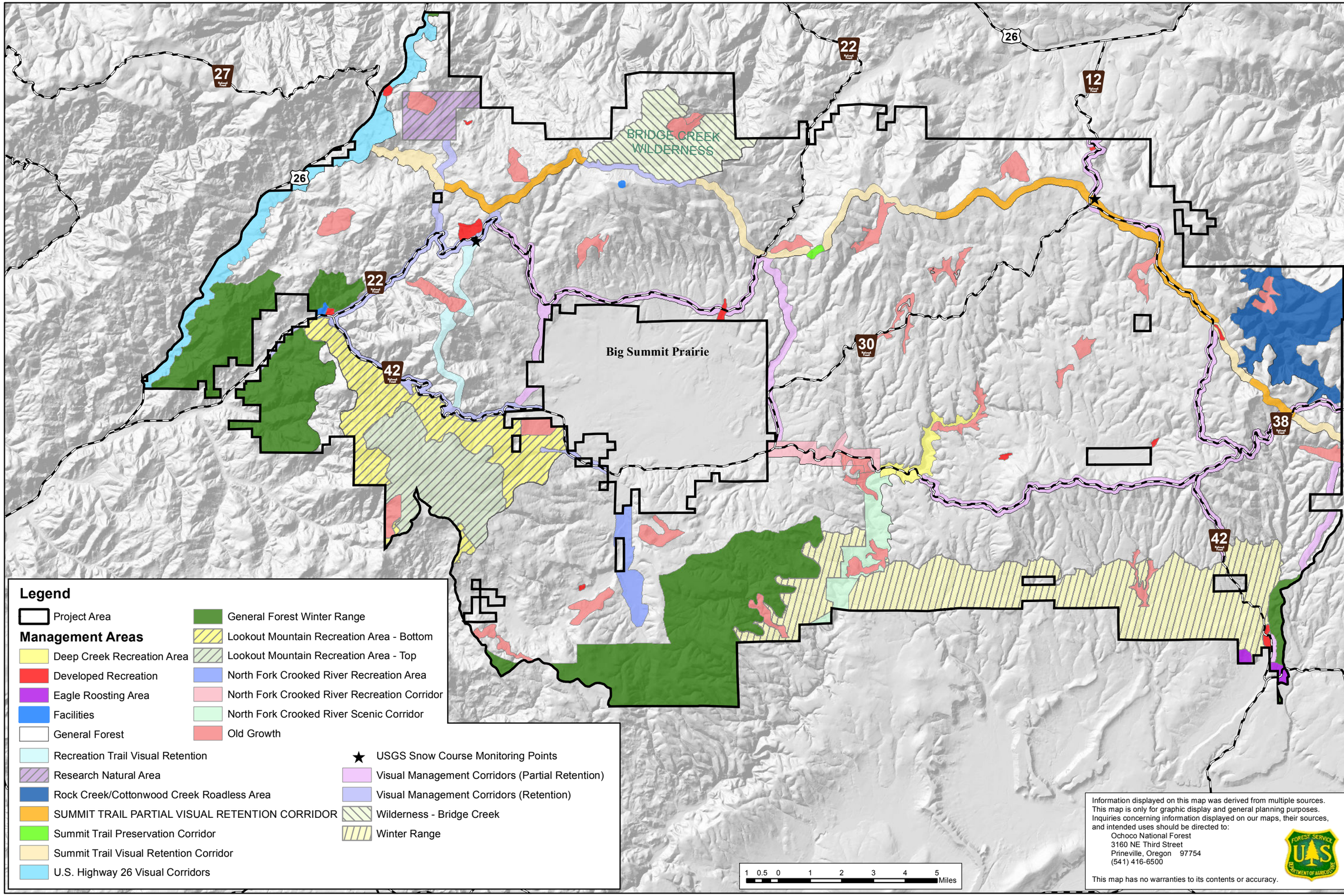
Map 1

Ochoco National Forest Lookout Mountain and Paulina Ranger Districts

Ochoco Summit Trail System Project Area

Ochoco Summit Trail System EIS

1/08/2013
T:\FS\NFS\Ochoco\Project\IomeisOchocoEastOHV2009\gis\tool\mxd\map1-vicinity.mxd



Map 2

Ochoco National Forest Lookout Mountain and Paulina Ranger Districts

Forest Plan Management Areas

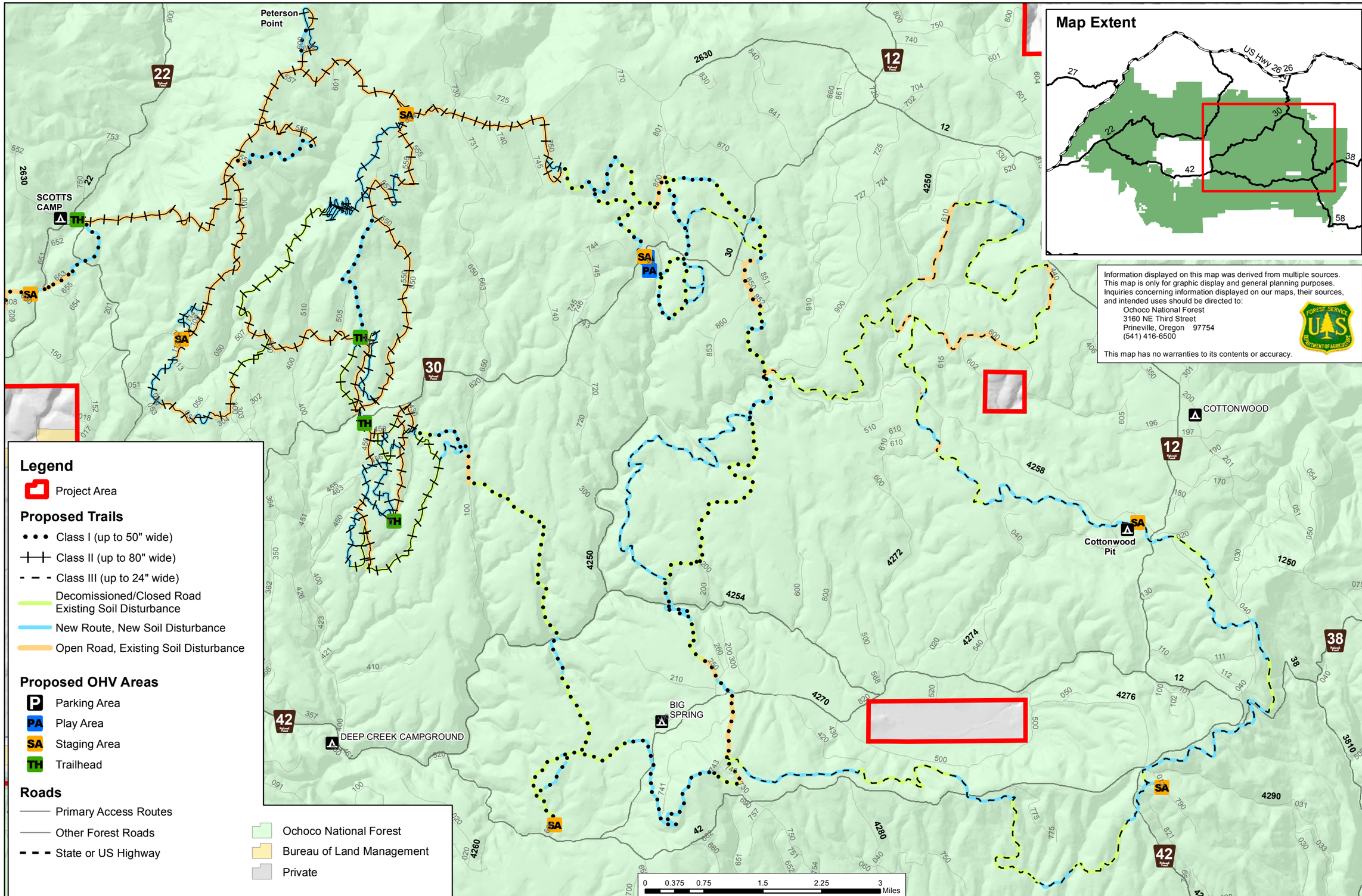
Ochoco Summit Trail System EIS

1/08/2013
T:\FS\NFS\Ochoco\Project\IomeisOchocoEastOHV2009\gis\tool\mxd\map2-Management Areas.mxd

Ochoco National Forest Lookout Mountain and Paulina Ranger Districts

Ochoco Summit Trail System EIS Alternative 2 (Proposed Action) - East Side

Map 3



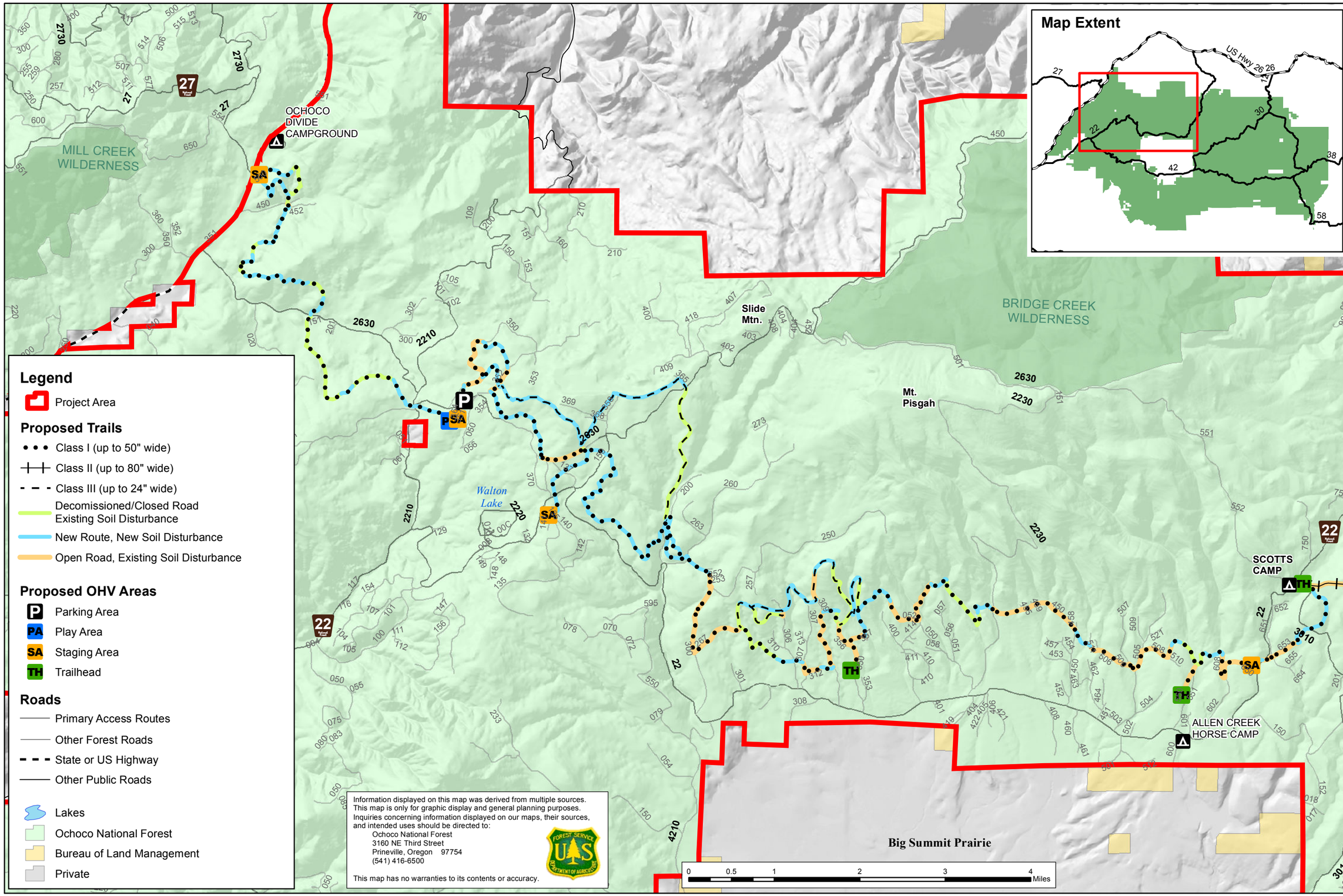
1/08/2013
T:\FS\NFS\Ochoco\Project\IomeisOchocoEastOHV2009\gis\tool\mxd\map3-Proposed Trails User Experience Soils Disturb -Eastt

Ochoco Summit Trail System EIS

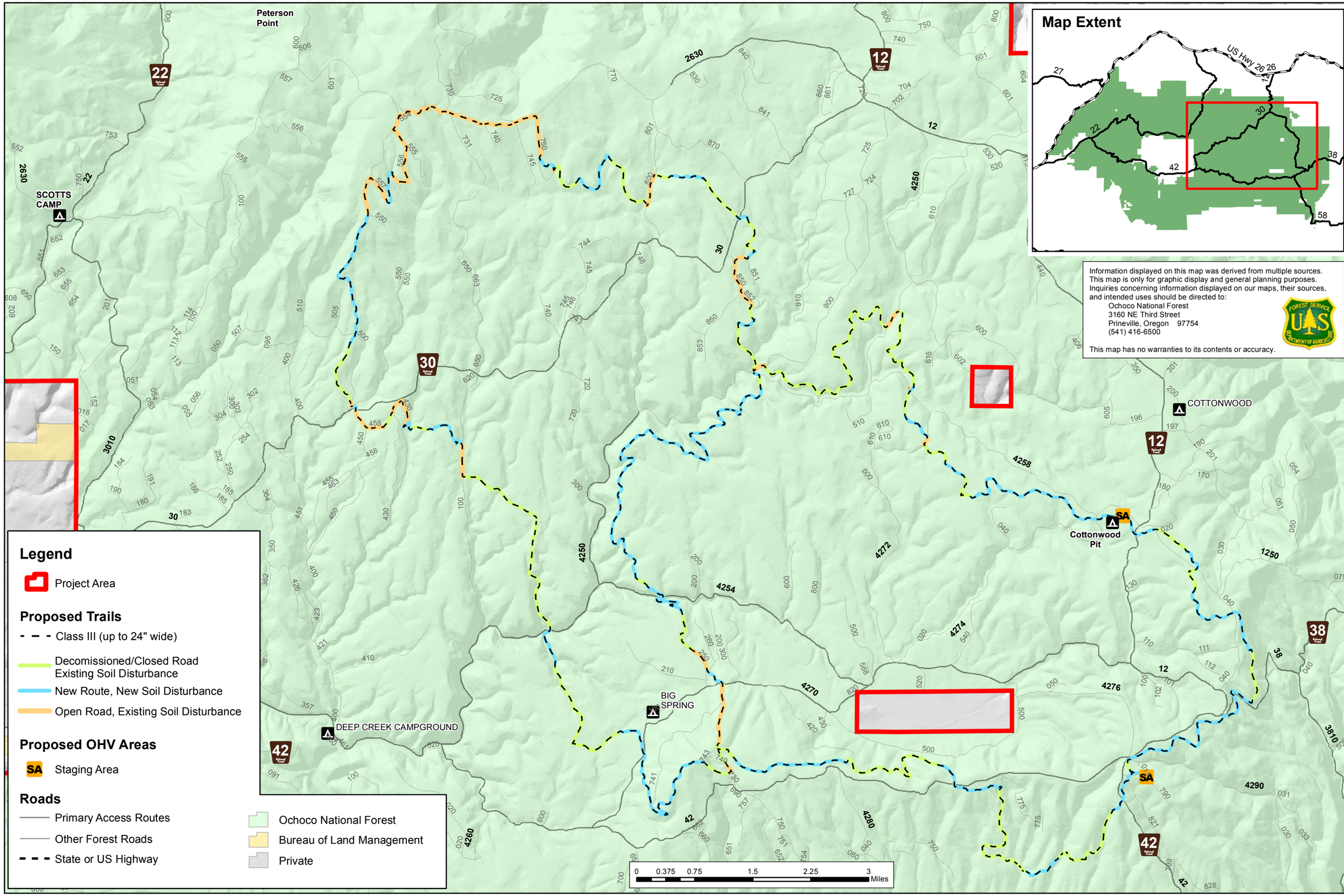
Alternative 2 (Proposed Action) - West Side

Ochoco National Forest Lookout Mountain and Paulina Ranger Districts

Map 4



1/08/2013
T:\FS\NFS\Ochoco\Project\IomeisOchocoEastOHV2009\gis\tool\mxd\map4-Proposed Trails User Experience Soils Disturb -West



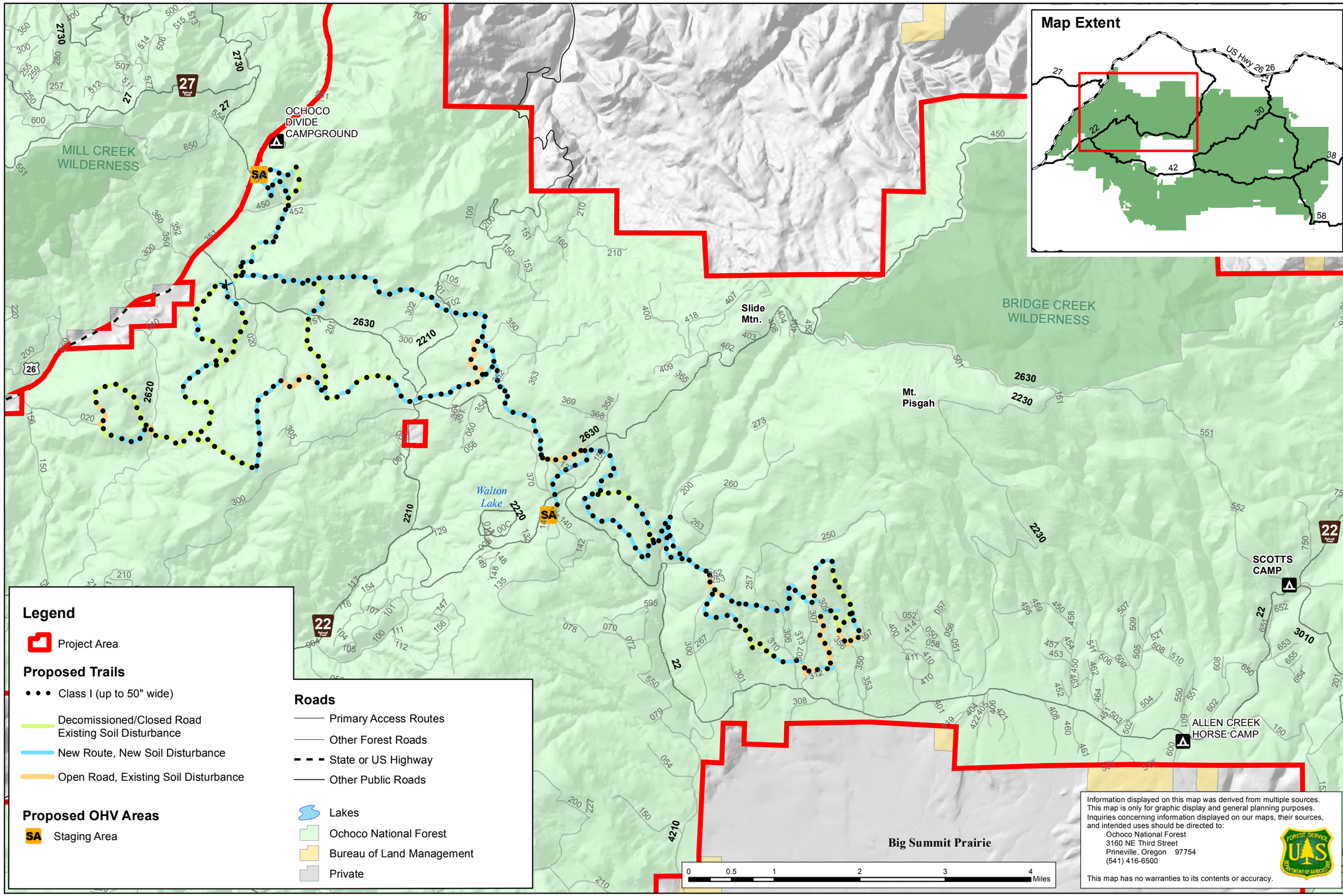
Map 5

Ochoco National Forest Lookout Mountain and Paulina Ranger Districts

Alternative 3 - East Side

Ochoco Summit Trail System EIS

1/08/2013
T:\FS\NFS\Ochoco\Project\IomeisOchocoEastOHV2009\gis\tool\mxd\map5-Alt3 Trails User Experience Soils Disturb -West



Map 6

Ochoco National Forest Lookout Mountain and Paulina Ranger Districts

Alternative 3 - West Side

Ochoco Summit Trail System EIS

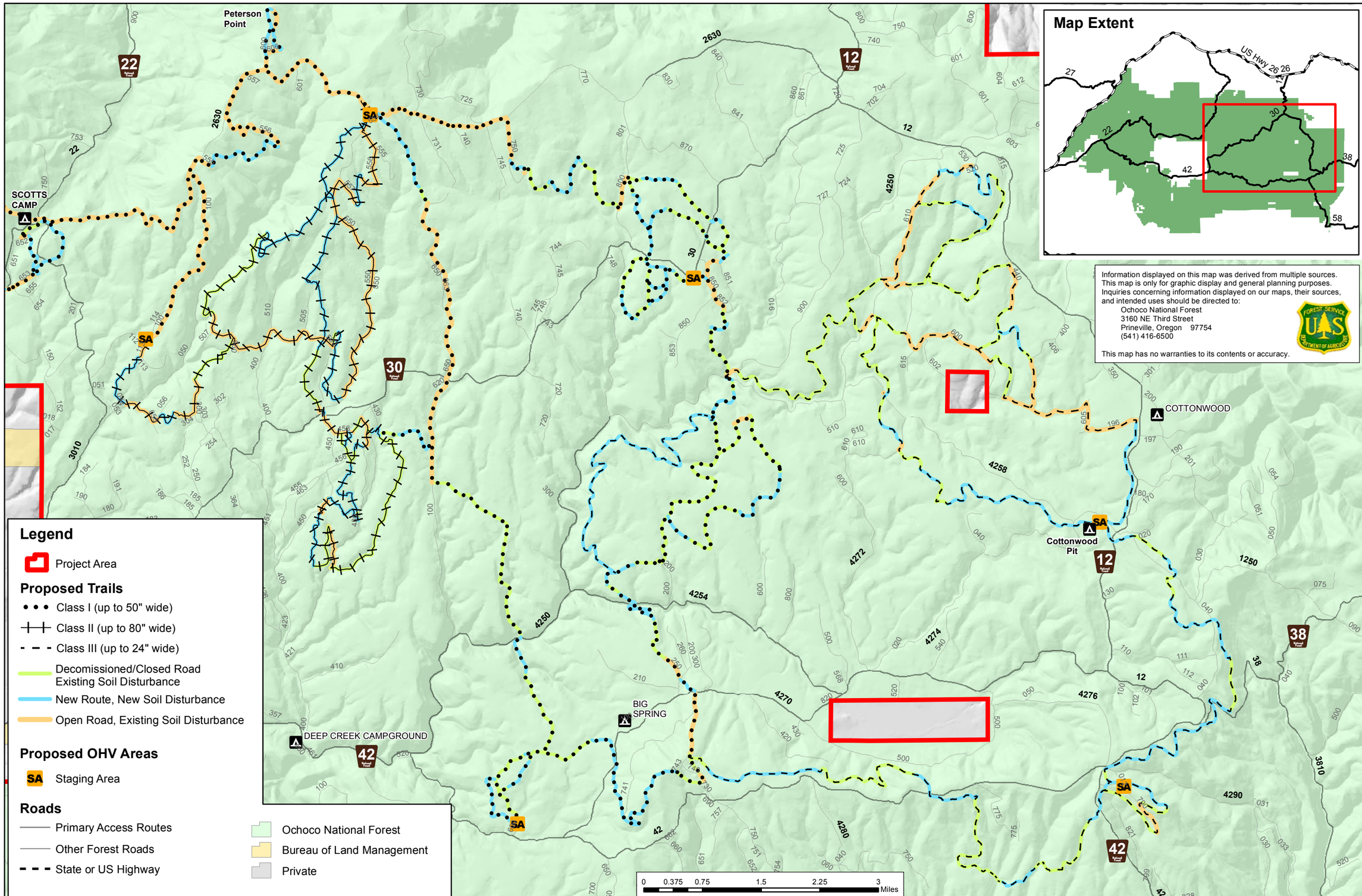
1/08/2013
T:\FS\NFS\Ochoco\Project\lomeisOchocoEastOHV2009\gis\tool\mxd\map6-Alt3 Trails User Experience Soils Disturb -West

Map 7

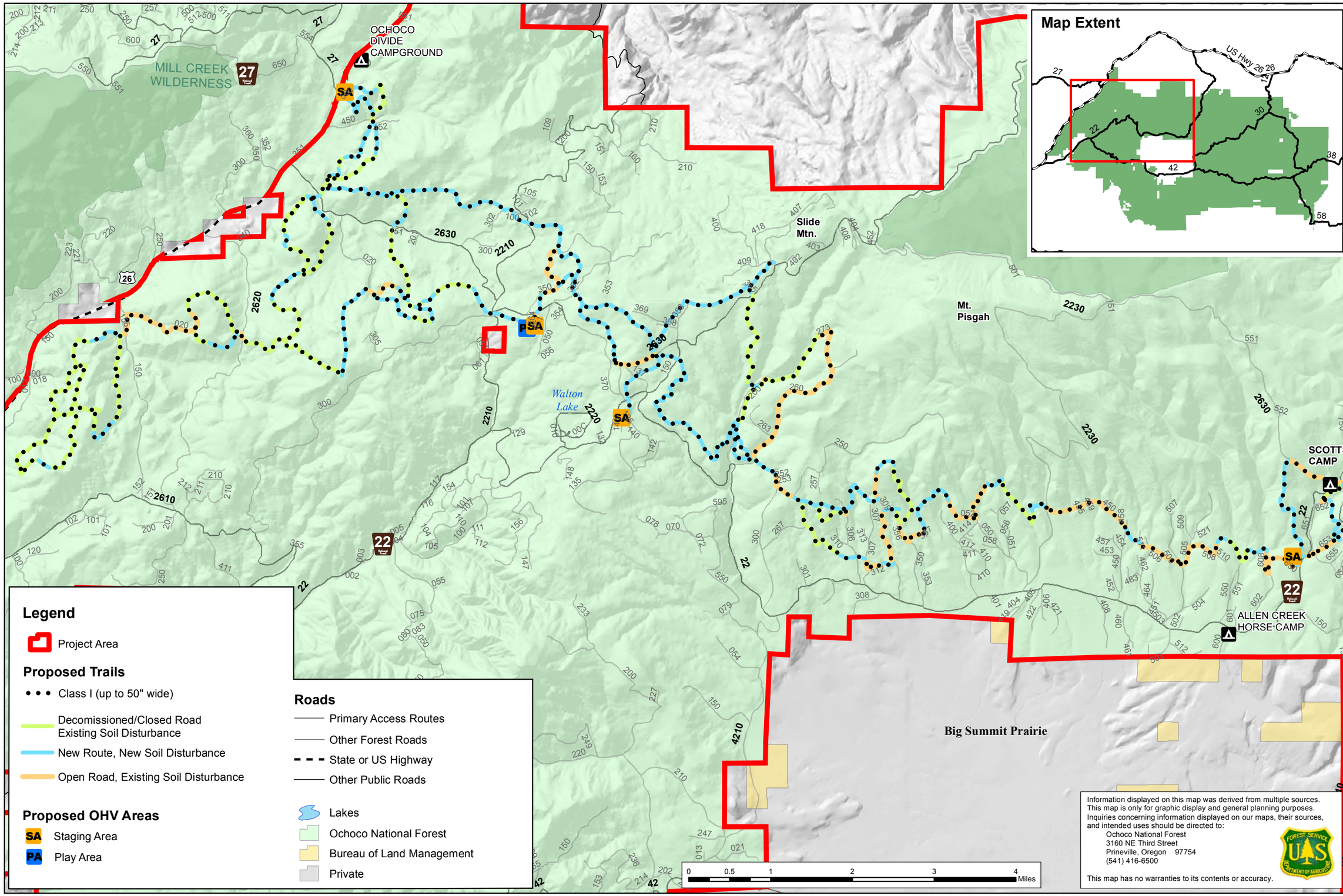
Ochoco National Forest Lookout Mountain and Paulina Ranger Districts

Alternative 4 - East Side

Ochoco Summit Trail System EIS



1/08/2013
T:\FS\NFS\Ochoco\Project\lomeisOchocoEastOHV2009\gis\tool\mxd\map7-Alt4 Trails User Experience Soils Disturb -West



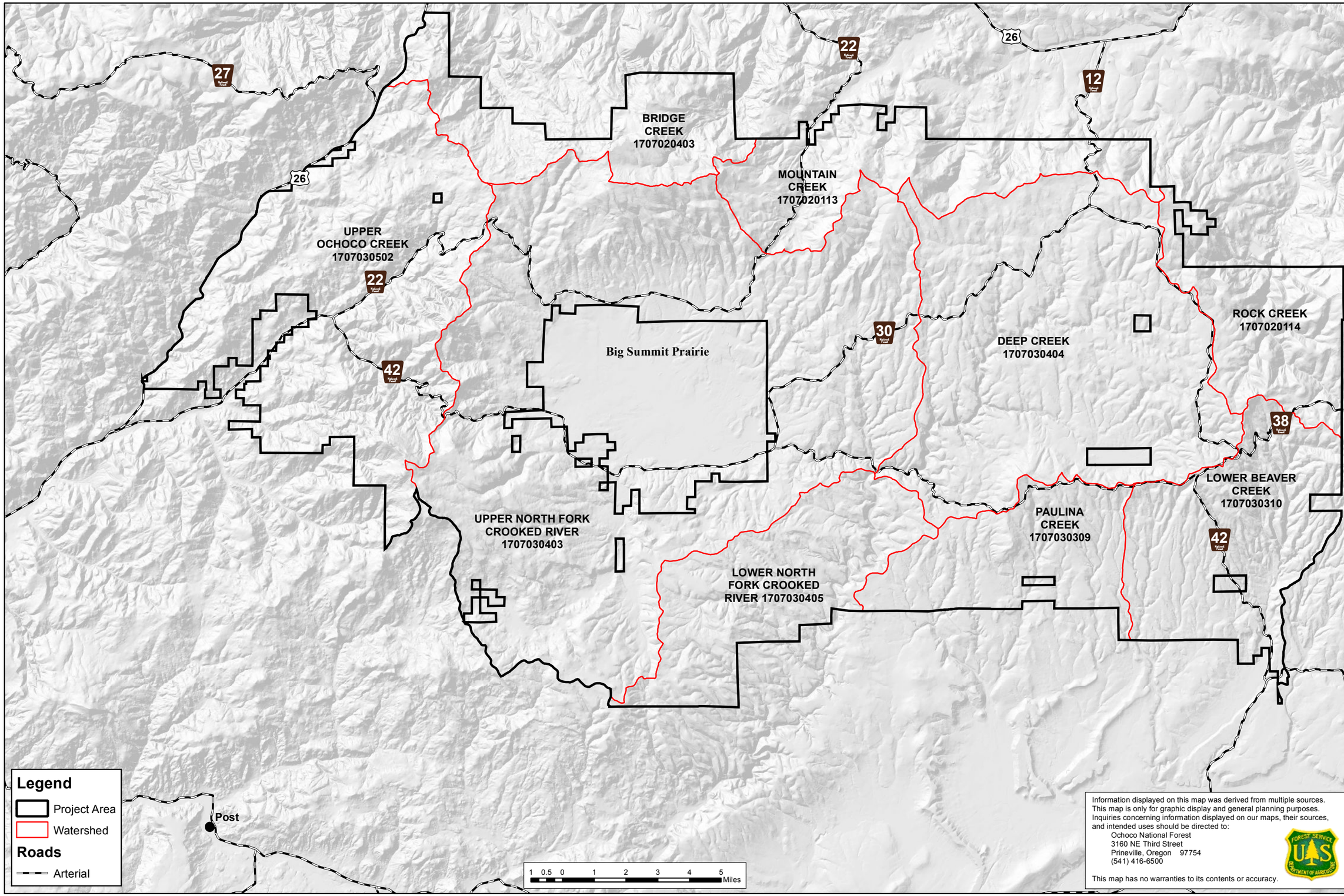
Map 8

Ochoco National Forest Lookout Mountain and Paulina Ranger Districts

Alternative 4 - West Side

Ochoco Summit Trail System EIS

1/08/2013
T:\FS\NFS\Ochoco\Project\IomeisOchocoEastOHV2009\gis\tool\mxd\map8-Alt4 Trails User Experience Soils Disturb -West



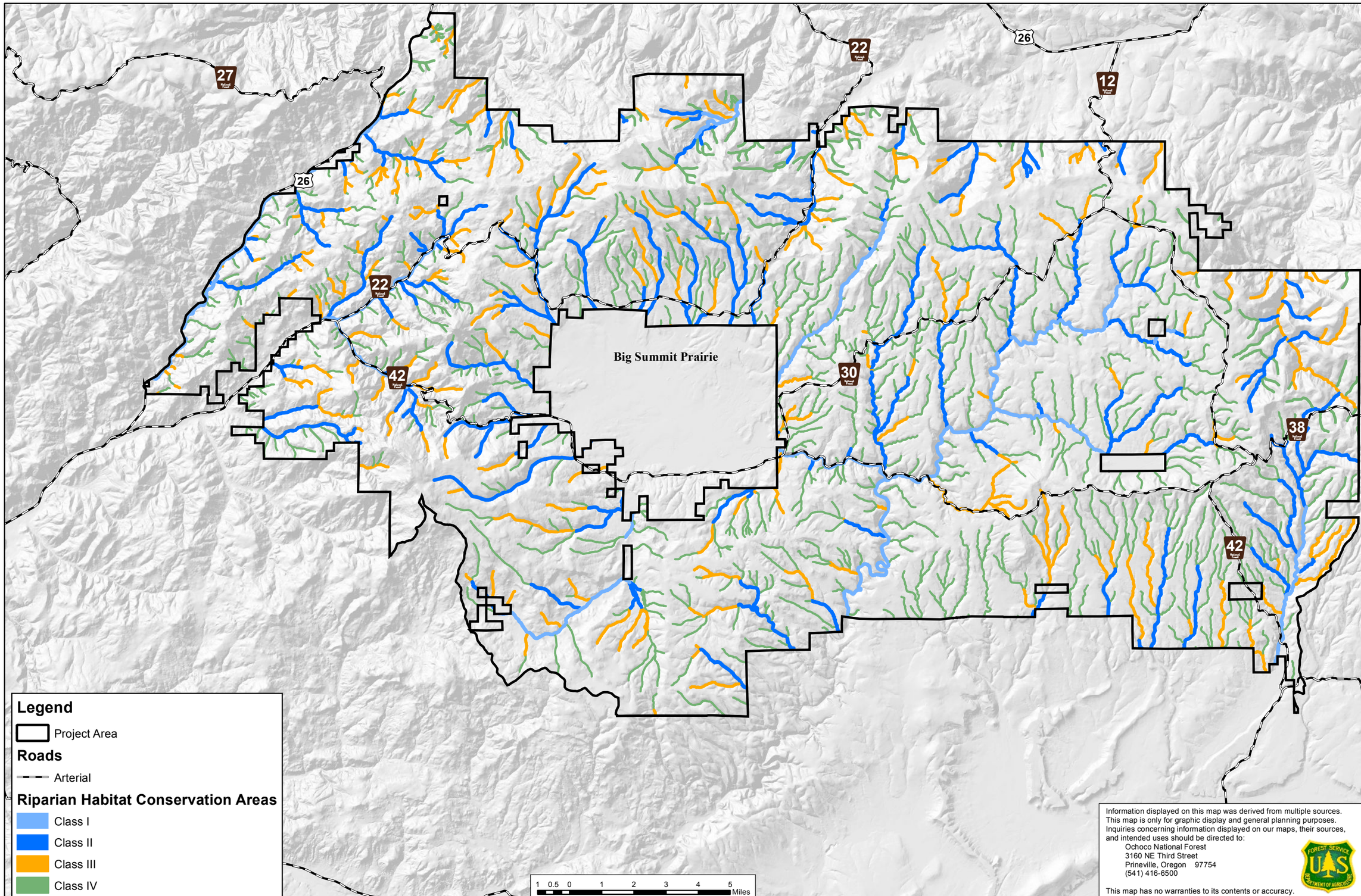
Map 9

Ochoco National Forest Lookout Mountain and Paulina Ranger Districts

Watershed Boundaries

Ochoco Summit Trail System EIS

1/08/2013
T:\FS\NFS\Ochoco\Project\lomeisOchocoEastOHV2009\gis\tool\mxd\map9-Watersheds.mxd



Map 10

Ochoco National Forest Lookout Mountain and Paulina Ranger Districts

Riparian Habitat Conservation Areas (RHCAs)

Ochoco Summit Trail System EIS

1/08/2013
T:\FS\NFS\Ochoco\Project\IomeisOchocoEastOHV2009\gis\tool\mxd\map10-RHCA.mxd