United States
Department of
Agriculture

Forest Service

Intermountain
Region

October 2013

Lost Creek–Boulder Creek Landscape Restoration Project

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Payette National Forest

The United States 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 the USDA's TARGET Center at 202-720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, DC 20250-9410, or call (800) 795-3272. USDA is an equal employment opportunity provider and employer

Draft Environmental Impact Statement for the Lost Creek–Boulder Creek Landscape Restoration Project

USDA Forest Service, Intermountain Region

Lead Agency:	USDA Forest Service
Responsible Official:	Keith Lannom, Forest Supervisor 800 West Lakeside Avenue McCall, ID 83638
For Information Contact:	Holly Hutchinson, Team Leader PO Box J 3674 Highway 95 New Meadows, ID 83654

Abstract

The Forest Service is analyzing proposed landscape restoration treatment activities in the 80,000 acre Lost Creek–Boulder Creek Landscape Restoration Project area on the New Meadows Ranger District of the Payette National Forest. The purpose of the proposed action is as follows:

1) Move vegetation toward the desired conditions defined in the Forest Plan and consistent with the science in the Forest's draft Wildlife Conservation Strategy.

2) Move all subwatersheds within the project area toward the desired condition for soil, water, riparian, and aquatic resources and improve the Boulder Creek subwatershed from the "Impaired" category to the "Functioning at Risk" category as described in the Watershed Condition Framework.

3) Manage recreation use in Boulder Creek and in the vicinity of Lost Creek with an emphasis on providing sanitation facilities, identifying and hardening dispersed recreation areas, and developing new trail opportunities.

4) Contribute to the economic vitality of the communities adjacent to the Payette National Forest.

The preferred alternative is Alternative B. This alternative proposes non-commercial and commercial thinning, prescribed burning, watershed improvements such as road closures, road decommissioning, and fish passage improvements, and recreation improvements including ATV/UTV trails and dispersed camping improvements. Alternative B responds to the purpose and need as stated above, and incorporates the recommendations of the Payette Forest Coalition and other concerns expressed in comment letters and public meetings.

Comments on this DEIS should be postmarked or received no later than 45 days after a Notice of Availability is published in the *Federal Register.* Comments should be addressed to the Payette National Forest; Attn: Holly Hutchinson, 800 West Lakeside Avenue, McCall, ID 83638, or sent electronically to comments-intermtn-payette@fs.fed.us. Electronic comments must be submitted in plain text or another format compatible with Microsoft Word. Reviewers should provide the Forest Service with their comments during the review period. This will enable the Forest Service to analyze and respond to comments at one time and to use the information to prepare the Final Environmental Impact Statement, thus avoiding undue delay in the decision-making process. Reviewers have the obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and will alert the agency to reviewers' positions 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 Statements (City of Angoon v. Hodel, 9th Circuit Court of Appeals, 1986 and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 [E.D. Wis. 1980]). Comments should be specific and should address the adequacy of the statement or merits of the alternatives discussed (40 CFR 1503.3).

This page intentionally left blank.

Lost Creek-Boulder Creek Landscape Restoration Project

Draft Environmental Impact Statement

Table of Contents

Chapter 1 – Purpose and Need 1

1.1 Introduction 1

1.2 Document Structure 1

1.3 Project Area 2

1.4 Summary of the Proposed Action 2

1.5 Existing and Desired Condition of the Project Area 5

1.5.1 Forested Vegetation, Fire and Fuels 5

1.5.2 Riparian Conservation Areas 6

1.5.3 Soil, Water, and Aquatics 7

1.6 Management Direction 8

1.6.1 Payette National Forest Land and Resource Management Plan 8

1.6.2 Wildlife Conservation Strategy 9

1.6.3 Aquatic Conservation Strategy 10

1.6.4 Watershed Condition Framework 10

1.7 Purpose and Need 10

1.7.1 Purpose 10

1.7.2 Need 11

1.8 Project Objectives 11

1.8.1 Forested Vegetation 11

1.8.2 Fire and Fuels 12

1.8.3 Soil, Water, Riparian, and Aquatic (SWRA) Resources 12

1.8.4 Wildlife 12

1.8.5 Recreation 13

1.8.6 Economics 13

1.9 Decisions to Be Made 13

1.10 Collaborative Efforts, Scoping, and Public Involvement 14

1.11 Tribal Consultation 14

1.12 Issues and Indicators 15

1.12.1. Forested Vegetation 15
1.12.2 Watershed Resources and Fish Habitat 16
1.12.3 Soil Productivity 18
1.12.4 Wildlife 18
1.12.5 Transportation 19
1.12.6 Recreation 20
1.12.7 Economics 20
1.13 Other Concerns Evaluated 21
1.13.1 Cultural Resources 21
1.13.2 Threatened, Endangered, and Sensitive Plants 22
1.13.3 Noxious Weeds 22
1.13.4 Rangeland Resources 23
1.13.5 Air Quality 24
1.13.6 Scenic Environment and the Recreation Opportunity Spectrum (ROS) 24
1.13.7 Climate Change 25
1.14 Permits and Licenses 27
1.15 Legal and Regulatory Requirements 27
1.16 Project Record and Specialist Reports 28
Chapter 2. Alternatives 29
2.1 Introduction 29
2.2 Alternatives 29
2.2.1 Alternatives Considered but Eliminated From Detailed Study 29
2.3 Alternatives Considered In Detail 30
2.4 Alternative A – No Action 30
2.5 Alternative B - Proposed Action 30
2.5.1 Alternative B Vegetation Treatments 30
2.5.2 Alternative B Prescribed Fire Treatments 37
2.5.3 Alternative B Watershed Improvement and Restoration Treatments 38
2.5.4 Alternative B Recreation Improvements 41
2.6 Alternative C 49
2.6.1 Alternative C Vegetation Treatments 49
2.6.2 Alternative C Prescribed Fire Treatments 50
2.6.3 Alternative C Watershed Improvement and Restoration Treatments 50
2.6.4 Alternative C Recreation Improvements 53
2.7 Alternative D 59

2.7.1 Alternative D Vegetation Treatments....59
2.7.2 Alternative D Prescribed Fire Treatments....60
2.7.3 Alternative D Watershed Improvement and Restoration Treatments....60
2.7.4 Alternative D Recreation Improvements....60
2.8 Alternative E....64
2.8.1 Alternative E Vegetation Treatments....64
2.8.2 Alternative E Prescribed Fire Treatments....65
2.8.3 Alternative E Watershed Improvement and Restoration Treatments....65
2.8.4 Alternative E Recreation Improvements....66
2.9 Management Requirements....71
2.10 Project Design Features/Mitigation Measures....75
2.11 Monitoring and Evaluation....94
2.12 Comparison of Alternatives....96
2.13 Identification of the Preferred Alternative....97
Chapter 3 – Affected Environment and Environmental Effects....99
3.0 Introduction....99
3.1 Forested Vegetation....100
3.1.1 Scope of Analysis....100
3.1.2 Desired Conditions....101
3.1.3 Existing Condition....102
3.1.4 Direct and Indirect Effects....110
3.1.5 Cumulative Effects....129
3.1.6 Irreversible and Irretrievable Commitments....131
3.1.7 Forest Plan Consistency....131
3.1.8 Project Record....134
3.2 Fire and Fuels....135
3.2.1 Scope of the Analysis....135
3.2.2 Desired Condition....135
3.2.3 Existing Condition....136
3.2.4 Direct and Indirect Environmental Effects....138
3.2.5 Cumulative Effects....142
3.2.6 Irreversible and Irretrievable Commitments....144
3.2.7 Forest Plan Consistency....144
3.2.8 Project Record....144
3.3 Watershed Resources....145

3.3.1 Scope of the Analysis 145
3.3.2 Desired Condition 145
3.3.3 Existing Condition 152
3.3.4 Direct and Indirect Environmental Effects 168
3.3.5 Cumulative Effects 186
3.3.6 Irreversible and Irretrievable Commitments 189
3.3.7 Forest Plan Consistency 189
3.3.8 Project Record 190
3.4 Soils 191
3.4.1 Scope of Analysis 191
3.4.2 Desired Condition 191
3.4.3 Existing Condition 193
3.4.4 Direct and Indirect Environmental Effects 200
3.4.5 Cumulative Effects 202
3.4.6 Irreversible and Irretrievable Commitments 203
3.4.7 Forest Plan Consistency 204
3.4.8 Project Record 204
3.5 Fisheries Resources 205
3.5.1 Scope of the Analysis 205
3.5.2 Desired Conditions 205
3.5.3 Affected Environment and Current Conditions 209
3.5.4 Direct and Indirect Effects 236
3.5.5 Cumulative Effects 252
3.5.6 Irreversible and Irretrievable Commitments 253
3.5.7 Forest Plan Consistency 253
3.5.8 Project Record 253
3.6 Wildlife 255
3.6.1 Scope of the Analysis 256
3.6.2 Desired Condition 256
3.6.3 Affected Environment 264
3.6.4 Direct and Indirect Environmental Effects 301
3.2.5 Irreversible and Irretrievable Commitments 363
3.2.6 Forest Plan Consistency 363
3.6.7 Project Record 363
3.7 Recreation 365

3.7.1 Scope of the Analysis 365
3.7.2 Desired Condition 365
3.7.3 Existing Condition 365
3.7.4 Direct and Indirect Environmental Effects 369
3.7.5 Cumulative Effects 381
3.7.6 Irreversible and Irretrievable Commitments 381
3.7.7 Forest Plan Consistency 381
3.7.8 Project Record 381
3.8 Transportation 383
3.8.1 Scope of analysis 383
3.8.2 Desired Condition 383
3.8.3 Existing Condition 386
3.8.4 Direct and Indirect Effects 387
3.8.7 Forest Plan Consistency 390
3.9 Economics Analysis 391
3.9.1 Scope of the Analysis 391
3.9.2 Affected Environment 391
3.9.3 Environmental Consequences 405
Chapter 4 Consultation and Coordination 423
Appendices A-1

Tables

Table 1-1. Project Area Potential Vegetation Groups and Associated Historic Fire Regimes 6
Table 1-2. Types of Water Sources and Associated RCA Widths 7
Table 1-3. Subwatershed WCI Rating and Restoration Priority 8
Table 2-1. Proposed Road Treatments by Subwatershed 40
Table 2-2. Alternative C Proposed Road Treatments by Subwatershed 52
Table 2-3. Alternative E Road Treatments 66
Table 2-4. Management Requirements 71
Table 2-5. Project Design Features/Mitigation Measures 75
Table 2-6. Monitoring 95
Table 2-7. Alternative Comparison Table 96
Table FV-1. PVGs within the Project Area 102
Table FV-2. Tree Size Class definition 105
Table FV-3 Tree Size Class Desired versus Existing Condition 106
Table FV-4. Canopy Cover Class Criteria 106

Table FV-5. Canopy Cover Class Desired Versus Existing Condition 107
Table FV-6. Desired versus Existing Species Composition (%) 108
Table FV-7. Reference Conditions and Existing Distribution of Successional Classes 110
Table FV-8. Acres treated to maintain and promote large tree size class by alternative 112
Table FV-9. Alternative B – Acres of Treatment Type by PVG and Tree Size Class 114
Table FV-10. Alternative C – Acres of Treatment Type by PVG and Tree Size Class 116
Table FV-11. Alternative D – Acres of Treatment Type by PVG and Tree Size Class 117
Table FV-12. Alternative E – Acres of Treatment Type by PVG and Tree Size Class 118
Table FV-13. Alternative B: Canopy Cover Class Effects 120
Table FV-14 . Alternative C: Canopy Cover Class Effects 121
Table FV-15. Alternative D: Canopy Cover Class Effects 122
Table FV-16 . Alternative E: Canopy Cover Class Effects 123
Table FV-17. Acres of treatment proposed to benefit Species Composition. 125
Table FF-1. Fire Regimes of the Payette National Forest 135
Table FF-2. Significant Recorded Wildfires (greater than 100 acres) within the Lost Creek-Boulder Creek Project Area 136
Table FF-3. Projected Fire Return Intervals by Fire Regimes in Lost Creek-Boulder Creek Project Area under the No Action Alternative 139
Table FF-4. Acres of Significant Movement toward Historic Fire Regimes by Alternative within Lost Creek-Boulder Creek 140
Table FF-5. Acres of Improved Historic Fire Regimes by Alternative within Lost Creek-Boulder Creek 140
Table FF-6. Comparison of Critical Thresholds Initiating Crown Fire Conditions within Units Proposed for Both, Thinning and Prescribed Fire 141
Table WS- 1. Subwatershed WCF Rating and Restoration Priority. 153
Table WS-2. BOISED Sediment Yield Estimates within the analysis area for 2013 154
Table WS-3. Channel Condition Risk for Boulder Creek Drainages within Analysis Area 159
Table WS-4. Channel Condition Risk for Upper Weiser River Drainages within Analysis Area 160
Table WS-5. Channel Condition Risk for West Fork Weiser River Drainages within Analysis Area 161
Table WS-6. Channel Condition Risk for West Fork Weiser River Drainages within Analysis Area 162
Table WS-7. Temperature Load for the West Fork of the Weiser River (2010 IDEQ) 166
Table WS-8. Issues and Indicators used in Watershed Analysis. 168
Table WS- 9. Miles of System Road by subwatershed and Maintenance Level. 169
Table WS-10. Drainages at or moved to above 25% ECA in the Analysis Area. 170
Table WS-11. Watershed Indicators for Direct and Indirect Effects – Comparison by Alternative 182
Table WS-12. Indicators for Watershed Cumulative Effects 186
Table SP-1. Landtype Information and Soil Interpretations within the Soils Analysis Area. 197
Table SP-2. Indicators– Comparison by Alternative 203

Table FH-1. ACS and WARS designations for subwatersheds in the Lost Creek-Boulder Creek project area..208

Table FH-2. RCA distances using Option 2 described in the Forest Plan (page B-34). 209

Table FH-3. Current functional ratings for selected WCIs by project area subwatershed (includes only the on-Forest portion of the subwatersheds). 218

Table FH- 4. Functional levels of the Physical Barriers WCI as described in the Forest Plan. The desired condition is the functioning appropriately value. 219

Table FH-5. Fish passage barriers identified for replacement in the Lost Creek-Boulder Creek Project in each 6th level subwatershed. 220

Table FH-6. Functional levels of the Road Density/Location WCI as described in the Forest Plan. The desired condition is the functioning appropriately value. 222

Table FH-7. Overall road density (existing conditions) in each of the 6th level subwatersheds in the Lost Creek-Boulder Creek Landscape Restoration Project Area. 222

Table FH-8. RCA road density in each of the 6th level subwatersheds in the Lost Creek-Boulder Creek Landscape Restoration Project Area. 223

Table FH-9. Forest Plan Watershed condition indicator for Sediment/turbidity. 224

Table FH-10. Environmental baseline for watershed condition indicator Sediment/Turbidity in the Lost Creek-Boulder Creek project area 224

Table FH-11. Forest Plan Watershed Condition Indicators for temperature, including temperature criteria for steelhead and chinook, bull trout and criteria for redband trout proposed by Nelson and Burns, 2007.....228

Table FH-12. Environmental baseline for watershed condition indicator Temperature in the Lost Creek-Boulder Creek Landscape Restoration Project Analysis area; desired conditions are WCI "Functioning Appropriately" values from the Forest Plan (USFS 2003) or criteria for redband trout proposed by Nelson and Burns 2007. ...228

Table FH-13. Forest Plan Watershed Condition Indicators for Large Woody Debris. Also includes LWD Natural Conditions described by Overton et al (1995). 230

Table FH-14. Environmental baseline for watershed condition indicator Large Woody Debris in the Lost Creek-Boulder Creek Landscape Restoration Project Analysis area; desired conditions are WCI "Functioning Appropriately" values from the Forest Plan (USFS 2003) or Natural Conditions described by Overton et al. (1995)(Unpublished data on file, Payette National Forest Supervisor's Office). 230

Table FH-15. Number of proposed crossing improvements and miles of connectivity restored in each project area subwatershed. 232

Table FH-16. Road Density/Location by subwatershed. 233

Table FH-17. RCA system road improvements and RCA system road decommissioning. 234

Table FH-18. Stream Miles Improved. Includes miles habitat connectivity (Table FH-15) and RCA system road improvements and RCA system road decommissioning from Table FH-17 (above). 234

Table FH-19. Acres of RCA vegetation treatments proposed in each alternative. RCA treatments are not proposed in Boulder Creek (GIS Data rounded to the nearest acre). 238

Table FH-20. Ares of RCA vegetation treatments proposed within 1 site potential tree height (120 feet) of intermittent stream channels. RCA treatments are not proposed in Boulder Creek (GIS Data rounded to the nearest tenth acre). 238

Table FH-21. Acres of proposed prescribed fire included in identified burn blocks in each subwatershed 238

Table WL-1. Wildlife Species Considered in the Analysis for the Lost Creek–Boulder Creek Landscape Restoration Project Draft Environmental Impact Statement. 262

Table WL-2. Stands selected from U.S. Forest Service data that are estimated to have a least 5 ponderosa pine per acre greater than or equal to 20 inches dbh in the Project Area (Mehl and Haufler 2004). 264

Table WL-3. Number of Snags per Acre by Diameter Group (DBH) and Potential Vegetation Group (PVG) and Relationship to the Historical Conditions for the Westside (Council, New Meadows and Weiser Ranger Districts) of the Payette National Forest. 266

Table WL-4. Current condition of White-headed Woodpecker source habitat (acres) 268

Table WL-5. Current condition of pileated woodpecker source habitat (acres)..... 271

Table WL-6. Current condition of Flammulated Owl source habitat (acres). 274

Table WL-7. Current condition of great gray owl source habitat (acres)..... 277

Table WL-8. Current condition of northern goshawk source habitat (acres). 280

Table WL-9. Northern goshawk Post-Fledging Areas (PFAs) identified for the Lost Creek – Boulder Creek Landscape Restoration Project. 282

Table WL-10. Modeled Hiding Cover in each Elk Security Area (ESA) 288

Table WL-11. All Forest Service roads by 5th HUCs that may affect elk security. Open, Closed and Seasonal Roads are based on Motor Vehicle Use Map. 291

Table WL-12. Change in white-headed woodpecker habitat by Alternative and Potential Vegetation Group (acres) for large tree and low canopy, immediately post-harvest (short-term)..... 303

Table WL-13. Change in white-headed woodpecker habitat by Alternative and Potential Vegetation Group (acres) for medium tree and low canopy that will become habitat 5-30 years post treatment (long-term). 303

Table WL-14. Change in white-headed woodpecker habitat by Alternative and Potential Vegetation Group (acres) short and long term combined. 304

Table WL-15. Acres of pileated woodpecker source habitat, by Potential Vegetation Group (PVG), for all alternatives 312

Table WL-16. Acres of flammulated owl source habitat, by Potential Vegetation Group (PVG), for all alternatives. 319

Table WL-17. Acres of great gray owl source habitat for all alternatives by PVG immediately after harvest. .. 327

Table WL-18. Acres of Northern Goshawk source habitat for all alternatives, by Potential Vegetation Group (PVG), immediately after harvest 336

Table WL-19. Acres of Hiding Cover in each Elk Security Area (ESA) by Alternative 346

Table WL-20. Percent Hiding Cover in each Elk Security Area (ESA) by Alternative..... 347

Table WL-21. Proposed changes in roads by Alternative for Upper Weiser River, West Fork Weiser, Middle Little Salmon River, 5th HUCs for the Lost Creek-Boulder Creek Project Area that may affect elk security. .. 353

Table WL-22. Vegetation Treatments on Elk Winter Range (Acres). 354

Table WL-23. Modeled Calving Habitat by Alternative (Acres). 355

Table WL-24. Priority #1 Habitat Treatments (Acres)..... 361

Table WL-25. Priority #2 Habitat Treatments (Acres)..... 361

Table WL-26. Summary of Effects Determinations for wildlife species analyzed for the Lost Creek–Boulder Creek Landscape Restoration Project. 362

Table RC-1. Existing designated and/or maintained trails within the project area. 367

Table RC-2. Alternative A - Existing open roads and trails within the project area. 370

Table RC-3. Alternative B – Open Roads and Trails within the project area. 372

Table RC-4. Recommended Dispersed Campsite Improvement within Lost Creek and Restoration work by site number (reference Recreation Map x for site numbers)....373

Table RC-5. Non-motorized Trail Loop Proposals....377

Table RC-6. Alternative C – Open Roads and Trails within the project area 379

Table T-1. Forest Wide Goals, Objectives, Standards, and Guidelines for Roads (FP III-58 to 60) 383

Table T-2. Road Actions in support of Timber and Bio-mass Harvest....387

Table T-3. Suited Timber Lands within ¼ mile of a System Road (includes closed roads) 389

Table T-4. Suited Timber Lands within ¼ mile of Open System Road (includes Administrative use only roads) 390

Table EC-1. Historic Population Counts and Growth Rates: 1990, 2000, and, 2010 392

Table EC-2. Population Density 393

Table EC-3. Median Age 393

Table EC-4. Educational Attainment, Percent of Persons 25+ 394

Table EC-5. Per Capita Income, 1990 & 2011 (adjusted for inflation and reported in 2011 dollars)....399

Table EC-6. Average Annual Wages....400

Table EC-7. Non-labor Income....401

Table EC-8. Poverty by Race and Ethnicity, 2011 405

Table EC-9. Annual Employment by Activity Type under the Alternatives 408

Table EC-10. Annual Labor Income by Activity Type under the Alternatives (thousands of dollars)....408

Table EC-11. Forest Product Volumes by Alternative over the life of the Project....409

Table EC-12. Present Value of Lost Creek-Boulder Creek Treatments over 10-year Period, 4 Percent Discount Rate 409

Table EC-13. Cumulative Effects of Alternative B 415

Table EC-14. Cumulative Effects of Alternative C 417

Table EC-15. Cumulative Effects of Alternative D 419

Table EC-16. Cumulative Effects of Alternative E....422

Figures

Figure 1-1. Lost Creek-Boulder Creek Project Area and Vicinity Map....4

Figure 1-2. Average Temperature Changes for Idaho from 1951-2006....26

Figure 1-3. Average Precipitation Changes For Idaho from 1951-2006....27

Figure 2-1. Alternative B Vegetation Treatments 43
Figure 2-2. Alternative B, C and D Prescribed Fire Treatments 44
Figure 2-3. Alternative B Watershed Restoration Treatments, North 45
Figure 2-4. Alternative B Watershed Restoration Treatments, South 46
Figure 2-5. Alternative B Boulder Creek Recreation Improvements 47
Figure 2-6. Alternative B Lost Creek Recreation Improvements 48
Figure 2-7. Alternative C Vegetation Treatments 54
Figure 2-8. Alternative C Watershed Restoration Treatments, North 55
Figure 2-9. Alternative C Watershed Restoration Treatments, South 56
Figure 2-10. Alternative C Boulder Creek Recreation Improvements 57
Figure 2-11. Alternative C Lost Creek Recreation Improvements 58
Figure 2-12. Alternative D Vegetation Treatments 61
Figure 2-13. Alternative D Watershed Restoration Treatments, North 62
Figure 2-14. Alternative D Watershed Restoration Treatments, South 63
Figure 2-15. Alternative E Vegetation Treatments 67
Figure 2-16. Alternative E Prescribed Fire Treatments 68
Figure 2-17. Alternative E Watershed North 69
Figure 2-18. Alternative E Watershed South 70
Figure FV-1. Vegetation Types in the Project Area 104
Figures FV-2 and FV-3. Immediate and 25 Year Post Vegetation Departure 128
Figure FF-1. Distribution of Fire Regimes across the Lost-Creek Boulder Creek Project Area (in Acres) 137
Figure WS-1. Watershed Analysis Area for Direct, Indirect and Cumulative Effects. 147
Figure WS-2. ECA for the Drainages within the Watershed Analysis Area 158
Figure WS-3. Boulder Creek – Annual Percent over Natural Sediment Yield over 25 years by Alternative Estimated by the BOISED Sediment Model. 169
Figure SP-1. Soils Analysis Area. 192
Figure SP-2. Geology within the analysis area. 194
Figure SP-3. Landtypes and LSP areas within the analysis area. 195
Figure SP-4. Photo of 2011 landslide along West Fork of the Weiser River in the project area 200
Figure FH-1. Lost Creek-Boulder Creek Landscape Restoration Project Fish and Fish Habitat Analysis Area, including streams and 6th level subwatershed boundaries. 206
Figure FH-2. Known Chinook salmon Distribution within the Lost Creek-Boulder Creek Project Area. Anadromous species are only found in the Boulder Creek subwatershed. 213
Figure FH-3. Known steelhead/redband trout distribution and DCH in the subwatershed in the Lost Creek-Boulder Creek Project Area (steelhead, the anadromous form of the species, and their DCH are present only in the Boulder Creek subwatershed). 214

Figure FH-4. Known bull trout distribution in the project area including critical habitat and bull trout patches proposed by the RMRS (Isaak et al. 2010). 215

Figure FH-5. Locations of fish and fish habitat data considered in the analysis of the Lost Creek-Boulder Creek Landscape Restoration Project. 217

Figure FH-6. Fish passage barriers identified for improvement in the Lost Creek-Boulder Creek Landscape Restoration Project 221

Figure FH-7. Temperature monitoring sites within the Lost Creek-Boulder Creek Landscape Restoration Project. 227

Figure WL-1. White-headed Woodpecker modeled source habitat, by Potential Vegetation Groups (PVGs) at Current Condition 269

Figure WL-2. Pileated Woodpecker modeled source habitat, by Potential Vegetation Groups (PVGs) at current condition. 272

Figure WL-3. Flammulated owl modeled source habitat, by Potential Vegetation Groups (PVGs) at current condition 275

Figure WL-4. Great gray owl modeled source habitat, by Potential Vegetation Groups (PVGs) at current condition 278

Figure WL-5. Northern Goshawk modeled source habitat and Post Fledgling Area, by Potential Vegetation Groups (PVGs) at Current Condition 281

Figure WL-6. The Boulder Lynx Analysis Unit (LAU) and other LAUs surrounding the Project Area 284

Figure WL-7. Canada lynx modeled source habitat in the Project Area (Boulder LAU), by Potential Vegetation Groups (PVGs). 286

Figure WL-8. Elk Security Areas (on NFS lands only) identified by a 0.5 mile buffer on open roads and motorized trails in summer 289

Figure WL-9. Existing vegetation in Elk Security Areas in the Project Area. Hiding cover is modeled using strata 23, 24, 34, 35. Potential hiding cover is modeled using stratum 32. 290

Figure WL-10. Elk winter range Lost Creek - Boulder Creek Project Area. Approximately 6,894 acres of winter range exists in the Project Area 293

Figure WL-11. Potential elk calving areas, Lost Creek - Boulder Creek Project Area. Green polygons represent southerly aspect, < 35 percent slope, and < 5,000 ft. elevation with high cover and interspersed browse 295

Figure WL-12. Northern Idaho ground squirrel (NIDGS) known colonies (n = 14), modeled Source Habitat by Potential Vegetation Groups (PVGs) and metapopulation areas for the Project Area 297

Figure WL-13. Bald Eagle modeled source habitat in the Project Area and known bald eagle nest. The map shows local rivers and larger perennial streams, with a 1-mile night-roosting buffer, to illustrate where bald eagles might be expected to occur in, or near, the Project Area 300

Figure WL-14. White-headed woodpecker modeled source habitat at Current Condition (Alternative A). 305

Figure WL-15. White-headed woodpecker modeled source habitat under Alternative B, short and long term 306

Figure WL-16. White-headed woodpecker modeled source habitat under Alternative C, short and long term 307

Figure WL-17. White-headed woodpecker modeled source habitat under Alternative D, short and long term 308

Figure WL-18. White-headed woodpecker modeled source habitat under Alternative E, short and long term 309

Figure WL-19. Pileated woodpecker modeled source habitat at current condition (Alternative A) 313

Figure WL-20. Pileated woodpecker modeled source habitat under Alternative B 314
Figure WL-21. Pileated woodpecker modeled source habitat under Alternative C 315
Figure WL-22. Pileated woodpecker modeled source habitat under Alternative D 316
Figure WL-23. Pileated woodpecker modeled source habitat under Alternative E 317
Figure WL-24. Flammulated owl modeled source habitat at current condition (Alternative A)..... 321
Figure WL-25. Flammulated owl modeled source habitat under Alternative B..... 322
Figure WL-26. Flammulated owl modeled source habitat under Alternative C..... 323
Figure WL-27. Flammulated owl modeled source habitat under Alternative D. 324
Figure WL-28. Flammulated owl modeled source habitat under Alternative E..... 325
Figure WL-29. Great gray owl modeled source habitat at Current Condition (Alternative A)..... 329
Figure WL-30. Great gray owl modeled source habitat under Alternative B..... 330
Figure WL-31. Great gray owl modeled source habitat under Alternative C..... 331
Figure WL-32. Great gray owl modeled source habitat under Alternative D 332
Figure WL-33. Great gray owl modeled source habitat under Alternative E..... 333
Figure WL-34. Northern goshawk modeled source habitat at current condition (Alternative A) 337
Figure WL-35. Northern goshawk modeled source habitat under Alternative B 338
Figure WL-36. Northern goshawk modeled source habitat under Alternative C 339
Figure WL-37. Northern goshawk modeled source habitat under Alternative D..... 340
Figure WL-38. Northern goshawk modeled source habitat under Alternative E 341
Figure WL-39. Canada lynx modeled source habitat in the Project Area (Boulder Creek Lynx Analysis Unit), by Potential Vegetation Groups (PVGs) 344
Figure WL-40. Modeled elk hiding cover in moderate and large tree stands and plantations treated under Alternative B. 349
Figure WL-41. Modeled elk hiding cover in moderate and large tree stands and plantations treated under Alternative C. 350
Figure WL-42. Modeled elk hiding cover in moderate and large tree stands and plantations treated under Alternative D. 351
Figure WL-43. Modeled elk hiding cover in moderate and large tree stands and plantations treated under Alternative E. 352
Figure WL-44. Potential elk calving areas, existing condition, Lost Creek - Boulder Creek Restoration Area . 356
Figure WL-45. NIDGS treatment Priority #1 and #2 Areas – Including Metapopulation areas - 4th of July, Lost Valley-Butter Gulch, and Price Valley (left to right) 359
Figure RC-1. Unauthorized road leading off the 089 road west of the reservoir. 366
Figure RC-2. Existing signs at the main southern entrance to Lost Valley Reservoir on Road 089. 367
Figure RC-3. Installed in 2012, CXT vault restroom at the Lost Valley Interpretive Trailhead site. 368
Figure RC-4. Existing Ant Basin #324 Trailhead. 369
Figure EC-1. Average Annual Unemployment, 1990-2011 395

Figure EC-2. 2010 Employment 397
Figure EC-3. Sector Employment as Share of Total State and County Employment 398
Figure EC-4. Racial Composition, 2011 403
Figure EC-5. Poverty Rates, 2011 404

Chapter 1 – Purpose and Need

1.1 Introduction

This Draft Environmental Impact Statement (DEIS) documents the analysis and discloses the potential temporary, short and long-term, direct, indirect, cumulative, irretrievable and irreversible environmental effects of the proposed action and alternatives for the Lost Creek-Boulder Creek Landscape Restoration Project (Lost Creek-Boulder Creek Project), on the New Meadows Ranger District of the Payette National Forest, in Adams County, Idaho. The Lost-Creek Boulder Creek Project was initiated in 2012 by an interdisciplinary (ID) team of resource specialists (see Chapter 4). The ID team analyzed conditions in the Lost Creek-Boulder Creek Project area and developed the proposed action based on that assessment. Proposed restoration activities include commercial and non-commercial vegetation treatments, prescribed burning, road closure and decommissioning, fish passage barrier improvements, and recreation improvements. These actions are described in detail of Chapter 2 of this DEIS.

1.2 Document Structure

This document was prepared using direction from the Council on Environmental Quality's (CEQ) regulations at 40 CFR 1500-1508, the Forest Service National Environmental Policy Act (NEPA) Regulations at 36 CFR 220, and other relevant laws and regulations. Additional documentation, including more detailed analyses of project-area resources, may be found in the project record.

Format for this DEIS follows the CEQ recommended format (40 CFR 1502.10). The format is as follows:

- **Cover Sheet:** The cover sheet details the agencies involved in the development of the statement, contact information, a brief abstract describing the contents of the document, and name and title of the responsible official. For a DEIS it includes the deadline date by which comments must be received.
- **Table of Contents:** A list of chapters, sections, appendices, and a listing of tables in the EIS.
- **Chapter 1 – Introduction**: This section 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.
- **Chapter 2 - Proposed Action and Alternatives**: This section provides a more detailed description of the proposed action and alternatives (based on issues raised by the public and other agencies) and potential project design features and mitigation measures needed. This section also provides a summary table of the environmental consequences associated with both alternatives.
- **Chapter 3 – Affected Environment and Environmental Consequences**: This section describes the affected environment and the environmental effects of the proposed action and alternatives. This analysis is organized by resources. Within each resource section, the

affected environment is described first, followed by the effects of the No Action Alternative that provides a baseline for evaluation and comparison with the proposed alternatives.

- **Chapter 4 – Consultation and Coordination:** Contains a list of those who helped prepare this document, and a list of agencies, organizations, and individuals and groups who responded during scoping.
- **Appendices**: The appendices provide more detailed information to support the analyses presented in the environmental assessment. These include:

  Appendix A - RCA Treatments

  Appendix B - NIDGS Vegetation Treatments

  Appendix C - Cumulative Effects

  Appendix D - Road Management and Special Uses

  Appendix E - Monitoring/Computer Modeling

  Appendix F - Legal Requirements

  Appendix G - References

  Appendix H - Glossary

1.3 Project Area

This project encompasses approximately 80,000 acres on the New Meadows Ranger District of the Payette National Forest. The project area is located approximately 10 miles north and west of New Meadows, Idaho in Boulder Creek, a tributary to the Little Salmon, and in the headwaters of the Weiser River and the West Fork of the Weiser River. The project area includes the Pony Creek Research Natural Area (RNA) and part of the Rapid River Inventoried Roadless Area (IRA). The project area consists of National Forest System lands located in the western portion of the New Meadows Ranger District in T18N, R1W; T19N, R2W; T20N, R1W; T20N, R2W; T21N, R1W, Boise Meridian surveyed (Figure 1-1).

1.4 Summary of the Proposed Action

A brief summary of the proposed action is as follows. A more complete description of the proposed action can be found in Chapter 2, section 2.5.

Proposed landscape restoration treatments activities that would occur under this project include:

- Vegetation treatments on approximately 40,000 acres, including commercial (22,000 acres) and non-commercial (18,000 acres) treatments. Associated actions include road maintenance and temporary road construction.
- Prescribed fire on approximately 45,000 acres.

- Watershed improvements including new long term road closures, road decommissioning, and 40 fish passage barrier improvements.
- Recreation improvements, including new trail developments, rerouting of existing trails, installing trail signs and information kiosks, improving and constructing trailhead parking, decommissioning outhouses and installing vault toilets, improving dispersed camping sites by designating sites and adding fire rings, and graveling campsites and campground access roads.

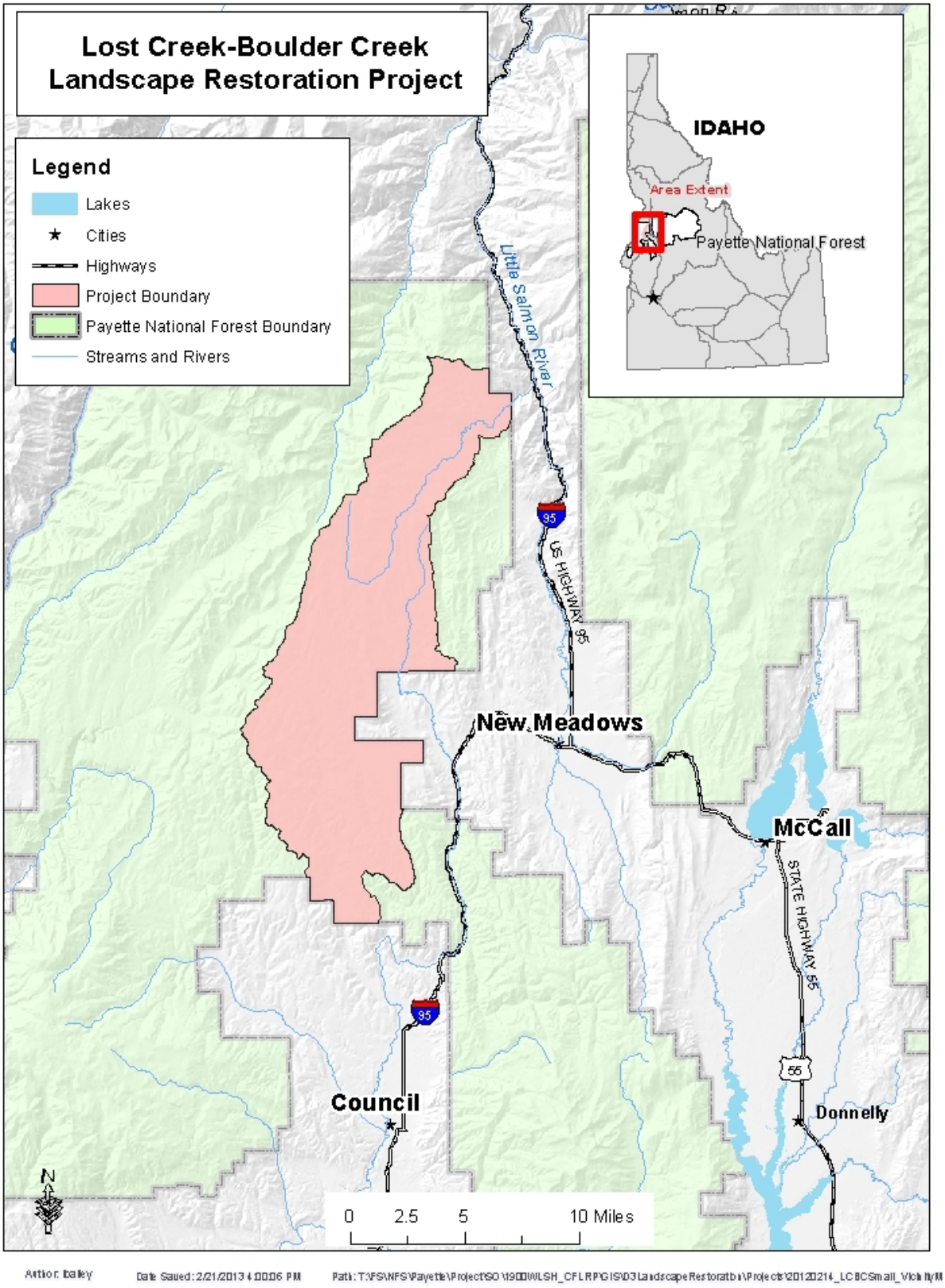


Figure 1-1. Lost Creek-Boulder Creek Project Area and Vicinity Map

1.5 Existing and Desired Condition of the Project Area

1.5.1 Forested Vegetation, Fire and Fuels

Vegetation within the project area is composed of both forested and non-forested vegetation types. Historically, wildfire disturbances helped shape forested landscapes across the project area. Decades of fire exclusion, forest management, insect outbreaks, and other factors have substantially altered forest structures, especially in the low- to-mid-elevation ponderosa pine forest that comprise about 65 percent of the forested acres in the project area. The differences between the current and desired forested vegetative conditions include:

- Less large tree size class than desired in drier forest types that historically supported relatively open ponderosa pine forest;
- More canopy cover than desired;
- Less early seral species (*i.e.* - ponderosa pine, western larch, and aspen) than desired.

These differences can generally be attributed to past fire exclusion and timber management practices and are similar to the trends identified in the analysis at the Forest-wide scale completed for the draft Wildlife Conservation Strategy (see Section 1.6.2 for more information on the Wildlife Conservation Strategy).

Decades of commercial timber harvests have removed the larger and more fire-resilient tree species (such as ponderosa pine and western larch), favoring species that are less fire-resilient (grand fir). Fire suppression has led to a buildup of ground, surface, and canopy fuels and favored the maturation of less fire-resilient species. Recurrent commercial harvests, fire suppression, and livestock grazing have led to:

- An increase in canopy densities;
- A decrease in canopy base heights (height to live crown);
- A change in species composition from a majority of more fire-resilient to less fire-resilient tree species;
- An increase in ground and surface fuels.

As a result, vegetation and fuel conditions are outside the range of natural conditions. Historically, the drier forest types (PVGs 1, 2, and 5[1]) of the project area consisted of a diverse understory of grasses, forbs, and low shrubs with a large-diameter fire-resilient overstory. This condition was maintained over time by frequent, low-intensity fires. The moister, mixed severity fire regimes of PVGs 3, 4, 6, 7, and 11 occurred in the Douglas-fir, grand fir, subalpine fir, and whitebark pine communities. Table 1-1 identifies the acres of different groups of vegetation in the project area.

[1] The classification system utilized in the Forest Plan is Potential Vegetation Groups (PVGs). An explanation and definitions of PVG can be found in Appendix A of the Forest Plan and in the draft Wildlife Conservation Strategy (USDA Forest Service 2011).

Table 1-1. Project Area Potential Vegetation Groups and Associated Historic Fire Regimes

Historic Fire Regimes	Potential Vegetation Groups*	Acres within Project Area	Percent of Project Area
Non-Lethal	1—Dry Ponderosa Pine/ Xeric Douglas Fir	1,705	2%
	2—Warm, Dry Doug. Fir/ Moist Ponderosa Pine	14,174	18%
	5—Dry Grand Fir	12,765	16%
	Non-forest (Grass/Shrub)	13,223	17%
Mixed Severity I	3—Cool, Moist Douglas Fir	14	0%
	4—Cool, Dry Douglas Fir	0	0%
	6—Cool, Moist Grand Fir	26,224	33%
Mixed Severity II	7—Warm, Dry Subalpine Fir	7,334	9%
	11—High Elevation Subalpine Fir	8	0%
Stand Replacement	8—Warm, Moist Subalpine Fir	686	1%
	9—Hydric Subalpine Fir	785	1%
	10—Persistent lodgepole pine	883	1%
Other (water, rock, or barren)		715	1%
Project Area Total		78,516	100%

* PVGs were classified into fire regimes according to the draft Wildlife Conservation Strategy.
Note: Non-forest (Grass/Shrub) has been added to the Non-Lethal Fire Regime

Due to fire suppression efforts, the project area has not experienced many significant wildfire events in the last century. Records show that the project area experienced 364 fire starts from 1956 to 2009, an average of seven fire starts per year. These fires were a tenth of an acre or less. The Wesley Fire is the largest wildfire on record in the Lost Creek-Boulder Creek Project area. The Wesley Fire occurred in 2012 and grew to 16,405 acres; of which 5,522 acres are within the project area. The 2004 North Star Butte Fire grew to 1,330 acres, of which 1,030 acres were within the project area. Two other larger fires, the Rock Jack Fire in 1996 (117 acres), and Sale Fire in 1989 (28 acres) also occurred in the project area.

Approximately 86 percent of the vegetated acres in the project area have missed two or more fire return intervals. Many of the Non-lethal and Mixed-Severity I Fire Regimes acres have transitioned to Mixed-Severity II and Stand Replacement Regimes in the project area. This is consistent with the fire regime research on the Payette National Forest by Sanders (1997), and Barrett (1987, 1994, 2000). This shift in fire regimes indicates that a higher percentage of the project area acres would likely burn at higher severities as well as larger patch sizes given a wildfire event. The extent to which an ecosystem has departed from historic conditions influences the extent to which key ecosystem components, critical to the integrity of the ecosystem, are altered. Uncharacteristic fire effects threaten desirable plant communities, ecological processes and the ability to protect life, investments, and other valuable resources.

1.5.2 Riparian Conservation Areas

Initial analysis in the project area indicates approximately 12,600 acres of vegetative treatments (*i.e.*, thinning and prescribed burning) in the Riparian Conservation Areas (RCAs) would be needed to maintain or move towards the desired vegetative conditions as specified in Appendix A of the Payette National

Forest Land and Resource Management Plan (USDA Forest Service 2003, hereafter referred to as the Forest Plan). This initial review indicates that approximately 6,100 acres of thinning treatments in RCAs would aid in improving or maintaining the desired vegetative conditions. The remaining 6,500 acres may need prescribed fire applied to maintain the desired conditions. Based on Forest Plan management direction and other resource concerns a detailed approach has been applied to develop an RCA treatment proposal that is consistent with management direction, including Appendix B of the Forest Plan and the Aquatic Conservation Strategy (ACS) (see section 1.6.3 for details on the ACS).

Field reconnaissance and stand exam data has indicated that PVG 2, 5, and 6 are the dominant PVGs in forested areas within the proposed activity units in the project area. RCA widths in forested areas will be based on the PVG 2 and PVG 6 site-potential tree height of 120 feet (Forest Plan page B-36). RCA widths that will be used for this project are displayed in the following table:

Table 1-2. Types of Water Sources and Associated RCA Widths

Water Source	RCA Width
Perennial Forested Streams (and intermittent streams providing seasonal rearing and spawning habitat)	240 feet (two site-potential tree heights) from the ordinary high water mark
Intermittent Forested Streams	120 feet (one site-potential tree height) from the ordinary high water mark
Ponds, Lakes, Reservoirs, and Wetlands	120 feet (one site-potential tree height) from the ordinary high water mark
Non Forested Streams (perennial and intermittent)	The extent of the flood prone width, or riparian vegetation, whichever is greater.

The current model identifies 16,250 acres within RCAs in the project area using the RCA delineation criteria above. Based on implementation of other projects, unmapped streams and other water sources are typically discovered during layout and implementation, generally increasing acres of RCAs by an additional 15 to 30 percent.

1.5.3 Soil, Water, and Aquatics

The desired condition within the project area for soil, water, riparian, and aquatic resources is to improve overall watershed functionality and integrity. This would include reducing sediment and other ecological effects from roads, improving stream bank stability and resiliency, improving aquatic organism and fish passage at road-stream crossings, improving long-term soil productivity, and improving riparian vegetation and floodplain function.

The Watershed Condition Framework (WCF) (detailed in section 1.6.4) identifies the desired condition for Watershed Condition Indicators (WCIs) at the subwatershed scale. All of the subwatersheds within the project area are identified as Class 3 - Impaired Function, except for the Lower West Fork of the Weiser which is Class 2 - Functioning at Risk (see Table 1-3).

Many subwatersheds have road densities that are contributing to reductions in long-term soil productivity, road-related sediment contributing to stream channels, negative effects to floodplains and RCAs, and changes to hillslope hydrology due to the intersection of subsurface water by cutslopes. Channel stability,

peak flows, and stream channel resiliency have likely been affected by past harvest, livestock grazing, and roads.

Table 1-3. Subwatershed WCI Rating and Restoration Priority

Subwatershed or drainage (as identified by 2003 Forest Plan)	2003 Payette Forest Plan Restoration Type/Priority	Watershed Condition Framework Rating[1] (as identified by subwatershed)
Upper West Fork Weiser River	Active/Moderate	Impaired (Class 3)
Lower West Fork River	Active/Moderate	Functioning at Risk (Class 2)
Upper Lost Creek	Active/Low	Impaired (Class 3)
Lower Lost Creek	Active/Moderate	
Upper Weiser River (East and West Branches)	Active/Low	Impaired (Class 3)
Boulder Creek	Active/High Identified Priority Watershed	Impaired Identified Priority Watershed (Class 3)

Opportunities for removing fish passage barriers, especially in the Boulder Creek subwatershed, (which is an ACS priority watershed), have been surveyed and important passage barriers have been identified. Sixteen road-stream crossings have been identified in the Boulder Creek subwatershed which is occupied by Endangered Species Act (ESA) listed fishes or is listed as Designated Critical Habitat (DCH). Outside of the Boulder Creek subwatershed, an additional 24 road-stream crossings have been identified as not meeting requirements for fish passage - the Lost Creek, Upper West Fork Weiser River and Upper Weiser River subwatersheds.

1.6 Management Direction

1.6.1 Payette National Forest Land and Resource Management Plan

The Payette National Forest Land and Resource Management Plan (Forest Plan) allocates emphasis to different areas of the Forest, based on the land's capabilities. The Forest Plan is divided into 14 Management Areas (MAs). The Lost Creek-Boulder Creek Project lies within three MAs:

- MA-3: Weiser River
- MA-4: Rapid River
- MA-5: Middle Little Salmon River

In addition to MAs, the Forest Plan delineates Management Prescription Categories (MPCs) that further define management emphasis in each of the MAs (which are fully described in the Forest Plan pp. III-78 through III-88). The Lost Creek-Boulder Creek Project area contains the following MPCs:

- **5.1-Restoration and Maintenance Emphasis within Forested Landscapes:** Emphasis is on restoring or maintaining vegetation within desired conditions in order to provide a diversity of habitats, reduced risk from disturbance events, and sustainable resources for human use.

- **5.2-Commodity Production Emphasis within Forested Landscapes**: The draft Wildlife Conservation Strategy (see section 1.6.2 below), proposes all acres of MPC 5.2 to be converted to MPC 5.1 based on the need to conserve habitat for the species of greatest concern. *In order to aid in conserving habitat, this project will use desired conditions for MPC 5.1 in place of desired conditions for MPC 5.2* (USDA Forest Service 2003, p. A-3 to A-9). The majority of management actions proposed with this project fall within MPC 5.1 as recommended by the draft Wildlife Conservation Strategy.

- **6.1-Restoration and Maintenance Emphasis within Shrubland and Grassland Landscapes**: Emphasis is on restoring or maintaining vegetation within desired conditions in order to provide a diversity of habitats, reduced risk from disturbance events, and sustainable resources for human use.

- **3.1-Passive Restoration and Maintenance of Aquatic, Terrestrial and Hydrologic Resources**: Emphasis on minimizing temporary-term risks, and avoiding short and long-term risks from management actions to soil/hydrologic conditions and aquatic and terrestrial habitats.

- **2.2-Research Natural Areas**: These areas provide unique opportunities for research and are managed to protect the unique values for which they were established.

- **4.1c-Undeveloped Recreation; Maintain Unroaded Character with Allowance for Restoration Activities**: Emphasis is on providing dispersed recreation opportunities in an unroaded landscape.

Additional management direction can be found on pages III-29 to III-31, III-41 to III-43, and III-38 to III-40 of the Forest Plan. Specific management direction is also described within each resource section of Chapter 3 of this document.

1.6.2 Wildlife Conservation Strategy

On January 13, 2011, the Payette National Forest released a Draft Environmental Impact Statement (DEIS) that proposes to amend the 2003 Forest Plan to include a Wildlife Conservation Strategy (WCS) for the Forested Biological Community (USDA Forest Service 2011). The draft WCS would prioritize the types of activities that should be undertaken to help maintain or restore habitat for wildlife species in greatest need of conservation. The draft WCS also would identify where these actions are most needed.

The draft WCS was developed in the context of the Interior Columbia Basin Ecosystem Management Project (ICBEMP) and complements the Idaho State Comprehensive Wildlife Conservation Strategy (ISCWCS) (IDFG 2005). The ISCWCS and assessments supporting the ICBEMP found that, in comparison to historic conditions, some specific habitats for wildlife species have declined substantially in geographic extent. As a result, conservation of many of the wildlife species dependent on these habitats is a concern. The underlying philosophy of the science and related conservation concepts supporting the ICBEMP and the draft WCS is that restoration of historic vegetative conditions and emulation of their inherent disturbance processes would conserve the vast majority of these species (Haufler et al. 1996; Hunter et al. 1988; Noss 1987; Raphael *et al*. 2000; McComb and Duncan 2007; Wisdom et al. 2000). The

goal of the draft WCS is to maintain or restore forested habitats that provide for a diversity of terrestrial wildlife species, consistent with overall multiple-use objectives. The short-term emphasis is on restoring habitats associated with species of greatest concern, such as low- to mid-elevation ponderosa pine forests.

1.6.3 Aquatic Conservation Strategy

The Aquatic Conservation Strategy (ACS) is a long-term strategy to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within lands administered by the Forest. The 2003 Forest Plan developed the ACS to provide direction to maintain and restore characteristics of healthy, functioning watersheds, riparian areas, and associated fish habitats. Priority subwatersheds across the Forest were identified as having the highest priority for active restoration. Within the project area, the Boulder Creek subwatershed was identified as an ACS priority.

1.6.4 Watershed Condition Framework

In 2011, the Watershed Condition Framework (WCF) defined a classification categorization process that was completed on the Payette National Forest as part of a national effort (Potyondy and Geier 2010). The intent of the National direction is to, first and foremost, protect high-value watersheds already in good condition, maintain the condition of watersheds to keep them from becoming threatened and, then, improve those in an impaired condition. Three watershed condition classes were recognized directly related to the degree or level of watershed functionality or integrity: Class 1 = Functioning Properly; Class 2 = Functioning at Risk; and Class 3 = Impaired Function. A Class 1 watershed has minimal undesirable human impact on natural, physical, or biological processes and is resilient and able to recover to the desired condition when disturbed by large natural disturbances or land management activities (Potyondy and Geier 2010). Conversely, a Class 3 watershed has exceeded some physical, hydrological, or biological threshold. Substantial changes to the factors that caused the degraded state are commonly needed to set them on a trend or trajectory of improving conditions that sustains physical, hydrological, and biological integrity. All of the subwatersheds within the project area are identified as Class 3 - Impaired Function, except for the Lower West Fork of the Weiser which is Class 2 - Functioning at Risk (see Table 1-3).

1.7 Purpose and Need

1.7.1 Purpose

The purpose of the Lost Creek-Boulder Creek Restoration Project is to:

1) Move vegetation toward the desired conditions defined in the Forest Plan and consistent with the science in the Forest's draft Wildlife Conservation Strategy (WCS), with an emphasis on:

a) Improving habitat for specific wildlife species of concern such as the ESA-listed northern Idaho ground squirrel and species dependent on dry coniferous forests (for example white-headed woodpecker), while maintaining habitat for other sensitive and listed species;

b) Maintaining and promoting large tree forest structure, early seral species composition (for example aspen, western larch, ponderosa pine, and Douglas-fir) and forest resiliency;

c) Reducing the risk of uncharacteristic and undesirable wildland fire, with an emphasis on restoring and maintaining desirable plant community attributes including fuel levels, fire regimes, and other ecological processes.

2) Move all subwatersheds within the project area toward the desired condition for soil, water, riparian, and aquatic resources and improve the Boulder Creek subwatershed from the "Impaired" category to the "Functioning at Risk" category as described in the Watershed Condition Framework, with an emphasis on:

a) Restoring habitat connectivity, especially in streams occupied by Endangered Species Act (ESA) - Listed fishes (Chinook salmon, steelhead and bull trout) and in their respective Designated Critical Habitat;

b) Reducing road-related accelerated sediment and other road related impacts;

3) Manage recreation use in Boulder Creek and in the vicinity of Lost Creek with an emphasis on providing sanitation facilities, identifying and hardening dispersed recreation areas, and developing new trail opportunities.

4) Contribute to the economic vitality of the communities adjacent to the Payette National Forest.

1.7.2 Need

The **need** for the project is based on the difference between the existing and desired conditions. These differences include:

1) Less large tree size class than desired in drier forest types, and higher canopy cover;
2) Less early seral species (*i.e.* ponderosa pine and western larch);
3) Less fire resilient species than desired;
4) Increase in ground and surface fuels;
5) Less than desired watershed function and integrity.

The desired conditions for this project are based upon the Forest Plan (USDA Forest Service 2003) the Watershed Condition Framework (USDA Forest Service 2011) and science in the draft Wildlife Conservation Strategy.

1.8 Project Objectives

Project objectives are elements of the purpose and need that the project is designed to address. The ID team developed quantifiable measurements for each objective.

1.8.1 Forested Vegetation

Objective 1: *Move vegetation toward the desired conditions defined in the Forest Plan, with an emphasis on promoting large tree forest structure, early seral species composition and forest resiliency.*

Measurements:

The following measurements will be evaluated post-treatment.

- Tree Size Class
  - Acres treated to promote or maintain the large tree size class.
  - Percentage of area (acres) in each tree size class.

- Canopy Cover
    - Percentage of area (acres) in each canopy cover class within the large tree size class.
- Species Composition
    - Acres treated to maintain and promote desired species composition.
- Spatial Patterns
    - Percent departure from reference conditions per Potential Vegetation Group.

1.8.2 Fire and Fuels

Objective 2: *Restore and maintain desirable fuel levels, fire regimes, and ecological processes.*

Measurement:

- Amount of departure from historic fire regimes.

1.8.3 Soil, Water, Riparian, and Aquatic (SWRA) Resources

Objective 3: *Move all subwatersheds within the project area toward the desired condition for SWRA resources and improve the Boulder Creek subwatershed from the "Impaired" category to the "Functioning at Risk" category as described in the Watershed Condition Framework, with an emphasis on:*

1. *Restoring fish habitat connectivity, especially in streams occupied by ES)-listed fishes and in designated critical habitat (DCH).*
2. *Reducing road-related accelerated sediment and other road related impacts*

Measurements:

- The number of crossings removed or replaced to specifically improve fish passage.
- Road density/location by subwatershed.
- Stream miles improved-includes miles of fish habitat re-connected and miles of stream enhanced through road decommissioning and other road treatments.
- Number of road/stream crossings improved.

1.8.4 Wildlife

Objective 4*: Improve habitat*[2] *for ESA-listed northern Idaho ground squirrel (NIDGS) and Family 1 wildlife species, as represented by the white-headed woodpecker, a Region 4 Sensitive Species (USDA Forest Service 2011) and Forest Management Indicator Species (MIS), by restoring forest conditions that contribute to source habitat for these species. Forested stands providing these source habitats should be restored to conditions within the Historical Range of Variability (HRV).*

[2] NIDGS source habitat is described in Appendix B - Background and Direction for Northern Idaho Ground Squirrel Treatments.

Measurements:

- Quantity and quality of Family 1 - white-headed woodpecker habitat restored to conditions within HRV. Quantity is measured by acres of PVGs 2, 5, and portions of PVG 6 in the Large Tree Size Class and Low (but not less than 25 percent) Canopy Closure Class. Quality is measured by the old forest and snags, patch size and distribution as described in Appendix E of the WCS.
- Acres treated adjacent to occupied NIDGS sites to expand suitable habitat in the most key areas

1.8.5 Recreation

Objective 5: *Manage recreation use in Boulder Creek and Lost Creek with an emphasis on providing sanitation facilities, identifying and hardening dispersed recreation areas, and developing new trail opportunities.*

Measurements:

- Miles of open motorized trail by vehicle class (per MVUM) for motorized trails, and miles of open and managed non-motorized trails. Miles of open road.
- Change to dispersed recreation sites measured by number of sites provided and recreation facilities provided in the sites.

1.8.6 Economics

Objective 6: *Contribute to the economic vitality of local communities.*

Measurements:

- Employment contribution (number of jobs on annual average)
- Income contribution

1.9 Decisions to Be Made

The Responsible Official for this project is the Payette National Forest Supervisor. Based on the analysis presented in this document, the Forest Supervisor will make the following decisions and document them in a Record of Decision (ROD) accompanying or following the Final Environmental Impact Statement (FEIS).

Should the Forest Service implement this project, including commercial and non-commerical vegetation treatments, fuels reduction, road management, watershed and fish habitat restoration, and recreation improvements at this time?

If so:

- What and how many acres should be treated and by what means?
- Which and how many recreation facilities, trails, and dispersed recreation sites should be approved, and by what means?

- Which, if any, trails, dispersed recreation facilities, and/or sites should be closed and rehabilitated?
- What road management, watershed restoration, and fish habitat improvements should be implemented?
- What project design features or mitigation measures are necessary to assure compliance with the Forest Plan?
- What monitoring requirements are appropriate to evaluate project implementation and effectiveness?

1.10 Collaborative Efforts, Scoping, and Public Involvement

This project is based in part on recommendations provided by the Payette Forest Coalition (PFC) to the Forest Supervisor on January 25, 2013. The PFC is a collaborative group formed under the Omnibus Public Land Management Act of 2009 (PL 111-11) and whose recommendations are structured to meet the intent of the Collaborative Forest Landscape Restoration Act (CFLRA). The purpose of the Collaborative Forest Landscape Program is to encourage the collaborative, science-based ecosystem restoration of priority forest landscapes. The PFC members represent stakeholders from a broad range of interests, including the environmental community, timber industry, recreational groups, and state and county government.

Initial scoping for this project occurred on February 22, 2013. Letters requesting comments were sent to approximately 312 local, state, and federal agencies, individuals and organizations. The complete mailing list is in the project record. Legal notices were published in the Idaho Statesman (the legal paper of record) on February 27, 2013, the Adams County Record on February 27, 2013, and the McCall Star-News on March 7, 2013. A Notice of Intent (NOI) was published in the Federal Register on February 25, 2013. In addition the New Meadows Ranger District hosted a public meeting to gather input on the project on March 20, 2013. This Project was first listed on the Payette National Forest's Schedule of Proposed Actions (SOPA) in July, 2012, and scoping letters, project description and other project information were posted on the Payette National Forest public website at http://www.fs.usda.gov/land/payette/landmanagement. Twenty-two responses were received during scoping. The comments were reviewed and the Forest Service's responses are summarized project record.

1.11 Tribal Consultation

Tribal governments have a special and unique legal and political relationship with the United States government as reflected in the United States Constitution, treaties, statutes, court decisions, executive orders, and memoranda. This relationship imparts a duty on all federal agencies to consult, coordinate, and communicate with American Indian Tribes on a government-to-government basis. Because Indian Tribes can be affected by the policies and actions of the Forest Service in managing the lands and resources under its jurisdiction, the Forest Service has a duty to consult with them on matters affecting their interests. Because of this government-to-government relationship, efforts were made to involve local tribal governments and to solicit their input regarding the proposed action.

The Forest Service introduced this project to the Shoshone-Paiute leaders during Wings and Roots Program meeting (government to government consultation) on April 12, 2012. Updates were provided to the

Shoshone-Paiute leaders during Wings and Roots Program meetings on December 13, 2012, February 14, 2013, April 11, 2013, June 14, 2013, and August 14, 2013.

The Forest Service presented the proposed action to the Nez Perce Staff on March 6, 2013. Updates were provided to the Nez Perce Staff on June 5, 2013 and September 4, 2013.

The proposed action was presented to the Shoshone-Bannock Tribe on September 11, 2013.

1.12 Issues and Indicators

Issues are used to develop alternatives and/or appropriate mitigation measures or project design features to address the effects of proposed activities. Indicators were developed for each issue, and are used to compare the effects of proposed activities by alternative.

1.12.1. Forested Vegetation

Issue 1: *The intensity of the vegetation treatments will affect how well the desired conditions for vegetation and wildlife are achieved.*

Background: The condition of forested vegetation has changed since European settlement, as described in section 1.5.1, above. Comments received during scoping identified concern over the intensity of vegetative treatments and the effects this would have on meeting the purpose and need of the project. Concerns regarding the attainment of canopy cover and species compositions objectives as well as concerns regarding the attainment of wildlife habitat were raised. Therefore, additional alternatives that propose different intensities and amounts of treatments were developed based on these concerns. Although the indicators for this issue are identical to the measurements identified for forested vegetation in section 1.8.1, above, the ID team felt it was important to acknowledge concerns raised and explain the rationale for the development of Alternatives C and D, which are described in Chapter 2 of this document. Issues regarding the intensity of vegetation treatments on wildlife are discussed in section 1.12.4, below.

Indicators: The following indicators will be evaluated after treatment.

- Tree Size Class
    - Acres treated to promote or maintain the large tree size class.
    - Percentage of area (acres) in each tree size class.
- Canopy Cover
    - Percentage of area (acres) in each canopy cover class within the large tree size class.
- Species Composition
    - Acres treated to maintain and promote desired species composition.
- Spatial Patterns
    - Percent departure from reference conditions per Potential Vegetation Group.

1.12.2 Watershed Resources and Fish Habitat

Issue 2: *Watershed conditions and sediment rates may be altered due to the proposed activities for roads, vegetative treatments, and prescribed fire within the analysis area.*

Background: Roads can have a major effect on watershed integrity due to increased sediment delivery to streams, decreased drainage efficiency, and interruption of subsurface flow (King 1989). Roads located adjacent to stream channels have the most opportunity to deliver sediment directly into stream channels and also to intercept subsurface flow if a cut slope is constructed.

The BOISED sediment yield model calculates predicted sediment delivered to streams based on past harvest, roads, and fire events and is used to compare alternatives. The measure "percent over natural" is the predicted amount of sediment from management activities above the natural level that would be expected without such activities.

Indicators by subwatershed:

- Maximum percent over natural sediment yield (Boulder Creek only BOISED Model output)
- Cumulative net difference in sediment yield over 10 years (Boulder Creek only BOISED Model output)
- Total miles of system road decommissioning that achieve long-term soil productivity and hydrologic function (obliteration)
- Total miles of unauthorized route treatments that achieve long-term soil productivity and hydrologic function (obliteration)
- Miles of system road decommissioning that achieve long-term soil productivity and hydrologic function (obliteration)within RCAs

Issue 3: *The number of roads selected for the Minimum Road System (MRS) and their maintenance level and location could affect sediment rates and long term watershed functionality.*

Background: In 2005, the Travel Rule (36 CFR 212) was changed to and included a requirement for Forests to identify the MRS and to identify roads that are no longer needed and should be considered for decommissioning or other uses, such as conversion to trails (36 CFR 212.5(b)). The minimum system is the road system determined to be needed to meet resource and other management objectives adopted in the relevant land and resource management plan (36 CFR part 219), to meet applicable statutory and regulatory requirements, to reflect long-term funding expectations, and ensure that the identified system minimizes adverse environmental impacts associated with road construction, reconstruction, decommissioning, and maintenance." This project level NEPA analysis is the final step required to identify the Minimum Road System within the project area.

Indicators:

- Total road miles (system and unauthorized routes) by subwatershed and maintenance level
- Total road density (system and unauthorized routes) by subwatershed
- Long-term annual percent over natural sediment yield (Boulder Creek only BOISED Model output)

Issue 4: *Proposed activities may change timing and duration of peak runoff and increase bank instability in sensitive stream channels.*

Background: Equivalent Clearcut Area (ECA) is a general index of the disturbance in a watershed from harvest activities over time. It broadly describes the vegetation condition in forested watersheds and correlates it to potential increases in water yield and changes in the timing of peak flows. Channel Risk is determined by evaluating the ECA together with the field inventoried channel stability and the sensitivity to disturbance assigned by Rosgen Stream Type (Rosgen 1996). Streams with finer substrate such as cobble or finer particles have more vulnerability to bank instability. These variables combine to determine a Channel Risk Rating for each drainage within the analysis area.

Indicators:

- Number of drainages where there is an increase in the Channel Condition Risk
- Number of drainages that are over 25 percent ECA (High Category)

Issue 5: *Treatments that propose thinning of vegetation in RCAs may negatively affect sediment delivery, stream temperatures and large woody debris (LWD).*

Background: The Payette Forest Plan states that "trees or snags that are felled within RCAs must be left unless determined not to be necessary for achieving soil, water, riparian, and aquatic desired conditions" (pg. III-22); and that "activities within RCAs that disturb or compact soils, destroy organic litter, remove large down wood, or otherwise reduce the effectiveness of RCAs as sediment filters should be avoided (pg. B-39). The analysis will describe the activities proposed in RCAs with respect to these Forest Plan requirements to determine effects by alternative.

Ground disturbing activities have the potential to increase sediment in streams, which can have many deleterious effects to salmonids and their habitats (particularly fine particles <6mm). Sediment can reduce the quality of fish habitat by filling in pools and interstices in the substrate that provide cover and refugia from streamflow. As a higher amount of fines occurs in the substrate, salmonid populations can be negatively affected (Reiser and Bjornn 1979).

Stream temperatures are the result of physical factors including insolation, air temperature, relative humidity, groundwater input, substrate composition, discharge rate and reach length (Cross 2002, Betscha et al. (1987). Chamberlin et al. (1991) and Johnson (2004) cite direct solar radiation as the primary factor affecting summer stream temperatures. Proposed project activities that could include the removal of streamside and overhanging vegetation, including the forest canopy, can increase insolation during summer months, resulting in elevated water temperatures. Conversely, the removal of insulating vegetation can result in colder winter temperatures in the winter. A TMDL (Total Maximum Daily Load) for temperature was approved by the EPA in 2007 for the West Fork of the Weiser River. Although shade is generally adequate for the on-forest portion of this waterbody, retaining existing shade for perennial streams in this watershed is a high priority to achieve the water quality goals.

Proposed project activities in RCAs can affect LWD which is an important biological and physical component in forested stream ecosystems (McDade et al. 1989). Large woody debris is an important source of cover and habitat for fish in streams and influences stream channel formation, pool formation,

and sediment transport and deposition (Sullivan et al. 1987, MacDonald et al. 1991). Pool frequency and formation is highly correlated to LWD (Quigley and Arbelbide 1997).

Indicators:

- Acres of RCA vegetation treatments
- Acres of treatment within one site potential tree height

1.12.3 Soil Productivity

Issue 6: *Proposed activities may decrease long-term soil productivity and impair soil-hydrologic function.*

Background: Proposed project and associated activities (such as road construction) can commit areas to non-productive uses for long periods of time. Soil productivity that is reduced for the long-term is defined as total soil resource commitment (TSRC). Forest Plan standard SWST03 (Forest Plan p. III-21) directs that in an activity area where existing conditions of TSRC exceed 5 percent, resource management (project) activities shall include project design features and restoration so that TSRC levels are moved back toward 5 percent or less following completion of the activities. In areas where existing conditions of TSRC are below 5 percent, TSRC must remain below 5 percent following the completion of project activities.

Movement of heavy equipment, site preparation, prescribed burning, and slash disposal activities may alter soil properties by compacting, displacing, puddling, or severely burning soils, potentially reducing their productivity. These conditions are not as severe or as long lasting as TSRC effects and are referred to as detrimental disturbance (DD). The Forest Plan standard SWST02 (Forest Plan p. III-21) directs that in an activity area where existing conditions of detrimental disturbance are above 15 percent, management activities shall maintain the area in a condition of 15 percent or less following completion. In areas where existing conditions of DD are already below 15 percent, DD must remain below 15 percent following the completion of project activities.

Indicators:

- Amount of Detrimental Disturbance (DD) within activity areas meets Forest Plan requirement
- Amount of Total Soil Resource Commitment (TSRC) within the project area meets Forest Plan requirement

1.12.4 Wildlife

Issue 7: *Restoration treatments, while a benefit to white-headed woodpeckers, may adversely affect source habitat for other wildlife species, such as pileated woodpecker, northern goshawk, elk, and lynx, which are dependent on denser mixed-conifer forests with multi-layer structural characteristics*.

Indicator:

- Quantity (acres) and quality (old forest and snags, patch and pattern) of habitat for wildlife species that require moderate to dense, mixed-conifer forests (pileated woodpecker (MIS) flammulated owl, elk, and lynx)

- Quantity (acres) and quality of low density ponderosa pine that serve as habitat for Family 1 wildlife species such as the white-headed woodpecker (MIS)

Issue 8: *Road densities affect wildlife (i.e., elk) security and can lead to the removal of important habitat components (snags) for cavity dependent wildlife.*

Indicator:

- Change in security areas (Hillis *et al*. 1991) and miles of NFS roads and unauthorized roads decommissioned by either physical closure, or by obliteration, and estimated effectiveness of decommissioning and resulting effects to elk and snags and wildlife species of concern.

Issue 9: *Project activities (logging, log haul, prescribed burning, and temporary road construction) may affect other wildlife species of concern, such as northern Idaho ground squirrel (NIDGS) and Canada lynx.*

Indicators:

- Quantity (acres) and quality of existing NIDGS habitat and acres treated to improve forage and population expansion.
- Quantity and quality of existing Canada lynx habitat.

Background: Changes in forested conditions, fire regimes, and the presence of roads have altered wildlife habitats. Some modifications to habitat have led to the federal listing of terrestrial wildlife species such as NIDGS. Project vegetation management may affect wildlife habitat through modification of vegetation characteristics or habitat composition. Prescribed burning and reduced ground cover could reduce habitat quality for some species and increase wildlife vulnerability.

A primary need Forest-wide and in the project area is to maintain and promote dry, lower elevation, large tree and old forest habitats for the associated wildlife species and reduce road densities and fragmentation that negatively affect elk and other Forest species of concern. The processes, function, patch size and diversity of forested habitats must all be considered in order to properly address wildlife habitat needs.

1.12.5 Transportation

Issue 10: *Proposed activities to the road system (i.e. road closures and decommissioning) may reduce the amount of access to the areas identified in the Forest Plan for active management. Road access is needed for economical active management activities, including timber and biomass harvest, thinning, and fuels treatments.*

Background: Roads are needed to transport goods and services to and from the Forest. Economical harvest of sawlogs and biomass requires roads within a reasonable distance for ground based and skyline logging. Helicopter logging requires much less road but is usually uneconomical especially for thinning and biomass removal. Open roads are needed for access for thinning, fuels treatments, firewood gathering, controlled burning, and fire suppression. Generally the closer these activities are to drivable road the less they cost.

Indicators:

- Acreage within suited timber base within ¼ mile from an existing system road.
- Acreage within suited timber base within ¼ mile from a drivable existing system road.

1.12.6 Recreation

Issue 11: *Project may change the existing recreational road and trail access in the Lost Creek/Boulder Creek watersheds.*

Indicator:

- Miles of open motorized trail by vehicle class (per MVUM) for motorized trails, and miles of open and managed non-motorized trails. Miles of open road.

Issue 12: *Project activities may change the existing recreational dispersed camping opportunities in the Lost Creek and Boulder Creek subwatersheds.*

Indicator:

- Change to dispersed recreation sites measured by number of sites provided and recreation facilities provided in the sites.

Background: The proposed project and associated activities (such as road decommissioning, prescribed fire, mechanized harvesting, dispersed recreation site closure and/or development) may affect the miles of road and trail available for use by the recreating public, and can affect access to the dispersed camping opportunities available to the public. There is a primary need in the project area to improve both motorized and non-motorized trail opportunities.

The existing dispersed camping use surrounding the Lost Valley Reservoir has grown and has become a resource concern because of steep, unauthorized routes pioneered in to access the dispersed sites; unmanaged growth of the sites; and the unhealthy sanitation conditions that have developed in the area because of the lack of restroom facilities. A primary dispersed recreation need in the project area is to improve the existing poor sanitation conditions surrounding the Lost Valley Reservoir due to the lack of restroom facilities, to improve road access into the dispersed camping sites.

1.12.7 Economics

Issue 13: *Costs associated with restoration activities under the proposed action are anticipated to exceed potential revenue generated over the life of the project. Although the proposed action would improve ecological health and function within the project area, the project may be perceived as economically inefficient from an accounting standpoint.*

Background: While the cost of forest restoration projects can easily be measured in monetary terms through the expenditures on treatment and other restoration activities, many of the benefits of forest restoration projects are not captured in traditional market transactions. To gain a more accurate

understanding of the benefits and costs of proposed actions, treatment costs must be analyzed alongside potential revenues and benefits realized from improved ecological conditions and reduced fire risk.

Indicators:

- Present value of treatment costs
- Benefits from reduced fire risk
- Non-market benefits of improved ecological conditions

1.13 Other Concerns Evaluated

The ID team evaluated other concerns that helped frame the scope of the analysis during the scoping process. These concerns were not considered issues because they could be resolved through project design, and therefore were not used to develop the alternatives analyzed in detail. These concerns are not addressed within the effects analysis by resource in Chapter 3 of this document because there were no effects to resources.

1.13.1 Cultural Resources

Since 1972, there have been over 50 federal actions providing Payette National Forest Heritage Program staff with the opportunity to conduct cultural resource site inventories on a variety of projects throughout the project area (see Appendix C, Cumulative Effects for a list of past projects). During the course of this work, heritage staff have identified and evaluated 36 archaeological sites using criteria established by the National Register of Historic Places. Nineteen of the previously identified Historic Properties met National Register of Historic Places criteria for eligibility.

During the summers of 2012 and 2013, approximately 230 acres of new survey in high probability areas as determined by the Forest's predictive model were conducted. Locations where proposed vault toilers are to be placed, and in areas where the road system would be altered were surveyed for archaeological sites. In addition, heritage staff monitored the 19 eligible historic properties potentially affected by the project, and updated fifteen site forms for Idaho SHPO submission; two previously eligible properties were determined to be ineligible.

In compliance with the requirements of the National Historic Preservation Act, section 106, the Forest will consult with the Idaho State Historic Preservation Office (SHPO), Heritage File PY2012-2605, with the following stipulations:

- All historic properties that are eligible to the National Register of Historic Places will be avoided from impacts during project implementation.
- Log and biomass landings would be determined in the field. If existing surveys are determined to be inadequate, a follow up consultation with Idaho SHPO would be required before these areas will be constructed.
- Fire line construction for Prescribed Fire treatment will have a cultural resource site survey to determine potential effects to historic properties. If existing surveys are determined to be inadequate, a secondary Idaho SHPO consultation would be required.

- Roads added to the Forest Service System, decommissioned, or newly constructed temporary roads would have a cultural resource review to determine potential effects to historic properties. If existing surveys are determined to be inadequate, a secondary Idaho SHPO consultation would be required.
- Proposed recreation actions would be required to be reviewed by heritage staff. If existing surveys are determined to be inadequate, a secondary Idaho SHPO consultation would be required prior to implementation.
- Site specific fish barrier restoration and road rehabilitation work will be required to be reviewed by heritage staff. If existing surveys are determined to be inadequate, a follow up consultation with Idaho SHPO will be required before these areas will be constructed.

The Forest will request a "No Adverse Effect" determination from Idaho SHPO.

Additional secondary consultations with the Idaho SHPO would occur as needed. As the project is implemented, the 19 eligible historic properties will be monitored and flagged for avoidance. Project staff will be informed as to the locations of the historic properties so as to avoid potential impacts to them.

1.13.2 Threatened, Endangered, and Sensitive Plants

No populations of any threatened, endangered or proposed federally listed plants occur within the project area; however habitat and populations for five rare plants do occur within the project area. The Forest Sensitive and Federal candidate species, whitebark pine, (*Pinus albicaulis*), the Forest sensitive plants Tolmie's onion (*Allium tolmiei var.persimile*), Bankmonkey flower (*Mimulus clivicola*), and Puzzling halimolobus (*Halimolobos perplexa var. perplexa*) and the Forest watch species, Sierra sanicle (*Sanicula graveolens)* were found during botanical surveys of the project area from 2011-2013. A Biological Evaluation (BE) covering Listed, Proposed, Candidate, Sensitive, Proposed Sensitive, and Forest Watch Species for the project is found in the Project Record and is hereby incorporated by reference. Key findings based on past botanical surveys and communications with US Fish and Wildlife Service follow:

- No Listed or Proposed Listed plant species or habitat is known to occur on the Payette National Forest. There would be "*no effect*" (NE) to habitat for any FWS Listed or Proposed Listed plant species. There would be no cumulative effects to any populations or potential habitat for any Listed or Proposed Listed species due to this project.
- This project *may impact individuals or habitat of whitebark pine, Tolmie's onion, Bankmonkey flower, Puzzling halimolobus, and Sierra Sanicula but would not likely contribute to a trend towards Federal Listing or cause a loss of viability to the population or species.* No impacts to populations or potential habitat for any other Candidate, Sensitive or Proposed Sensitive plant species would occur.

1.13.3 Noxious Weeds

Noxious weeds are defined as State-designated plants that cause negative ecological and economic impacts to both agricultural and other lands within the State (Forest Plan p. GL-26). Forest Service policy defines noxious weeds as those plant species designated as noxious weeds by the Secretary of Agriculture or by the responsible State official.

Noxious weeds generally possess one or more of the following characteristics: they are aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier host of serious insects or disease, and they are non-native or new to, or not common to, the United States or parts thereof (Forest Service Manual 2080). This definition encompasses invasive, aggressive, or harmful non-indigenous or exotic plant species (USDA Forest Service 1998). This analysis hereafter uses the term "noxious weeds" to include all variations included in the policy definition.

Noxious weeds within the project area have been managed with an Integrated Pest Management (IPM) approach, using mechanical, biological, and chemical methods. Current infestations include rush skeletonweed (*Chondrilla juncea*), Canada thistle (*Cirsium arvense*), perennial pepperweed (*Lepidium latifolium)*, oxeye daisy (*Leucanthemum vulgare*), spotted knapweed (*Centaurea stoebe*), yellow toadflax (*Linaria vulgaris*), and St. Johnswort (*Hypericum perforatum*).

Broadcast burning and pile burning may increase the rate of spread of noxious weeds. Road decommissioning may also limit access to treat noxious weed infestations within the project area. The Fire and Range Resource personnel would need to work together when burning around noxious weeds to determine what effect a light burn would have on the noxious weed spread. A concern when using prescribed fire around noxious weed sites is bare ground caused by burning. If bare ground exists the noxious weeds may out-compete the native vegetation in those areas.

Forest management activities can increase the potential for establishment and spread of noxious weed species. Seeds can be brought in on equipment and then fall off while working. Ground-disturbing activities such as road reconstruction and decommissioning can create conditions for the introduction, germination, and establishment of weed seeds. Activities that disturb soil and remove competitive, desirable vegetation create an ideal seedbed for weeds. Source sites of crushed rock or gravel can become infested with noxious weeds. Forest Plan standard NPST07 requires that source sites for gravel and borrow materials shall be inspected for noxious weeds prior to processing, use or transport. Seeds produced by infestations on the stockpile can be transported with the aggregate when it is hauled and placed on roads. Seed and straw for rehabilitation and reclamation work can transport weed seeds as well.

Continued noxious weed surveys and treatment work are required to reduce the risk of growing and new noxious weed infestations. Noxious weed treatments are addressed by management requirements and project design features derived from Forest Plan standards and guidelines (Forest Plan p. III-36 and III-37).

1.13.4 Rangeland Resources

Road Obliteration Impacts to Livestock Permittees

Livestock permittees use some project area roads for a variety of livestock management practices, including transporting salt and supplements to salting grounds, moving and distributing livestock throughout the allotment, and accessing range improvement projects for maintenance. Several of these roads have partially revegetated over time and only provide a trail for moving livestock by foot or horseback. Many of the roads are either Forest Service (FS) System roads closed to the public or, in some cases, unauthorized roads. Some roads are still navigated by all-terrain vehicles (ATVs), and permittees are given access for administrative purposes only on a case-by-case basis. Some of the roads used by the permittees for these activities are proposed for decommissioning (obliteration) and could impact livestock operations. All road decommissioning will provide for range access if needed. Range improvements would be identified and protected during project implementation (see Table 2-6 Project Design Features).

These concerns will be addressed through permit administration and on-going coordination with permittees. Section 2.10 contains project design features that address this concern.

Prescribed Fire Impacts to Livestock Permittees

Permittees have expressed concerns that the proposed landscape burns would negatively affect their grazing practices and require fencing or resting pastures. The proposed prescribed burning projects would be conducted over a multi-year period and be spread out over many units, varying in size and location. Prescribed burning typically occurs in the spring or late fall when temperatures, fuel moisture, and humidity are conducive to slow, cooler burns. Prescribed burns are not like wildfires, which usually burn under extreme summer conditions and can lead to highly altered landscapes that require as much as two growing seasons of rest from grazing. Depending on the time of year prescribed burning occurs, seasonal rest may be required, but under normal circumstances, prescribed fires would not require fencing and/or two growing seasons of rest from grazing. The proposed prescribed fires would stimulate growth of existing and new plants, which would eventually lead to increased livestock forage quality and quantity.

Grazing management would continue as currently permitted under the Term Grazing Permits, Allotment Management Plan (AMP), and Annual Operating Instructions (AOIs). Through continued coordination between Forest Service employees and permittees, the following measures would be taken before prescribed burning:

- The timing and location of prescribed burns would be coordinated between the permittees, Range Specialist, and Fuels Specialist with respect to annual grazing rotations on the allotment (see also Table 2-6, section 2.10).
- Range improvement projects would be inventoried and protected from prescribed fires (see Table 2-6, section 2.10). Any damage to fence lines, water tanks, or other range improvements by prescribed fire activities would be repaired.

1.13.5 Air Quality

Prescribed burning would be subject to approval from the Montana/Idaho State Airshed Group. This regional airshed group restricts burning to conditions when smoke dispersal is optimal and in compliance with national and state air quality regulations. The Hells Canyon Class I Airshed is located approximately six miles west of the project area. Due to the dominant transport wind direction and smoke monitoring efforts, smoke is not expected to adversely affect this airshed. No non-attainment areas occur within 14 miles of the proposed burn areas. Residents of potentially affected areas would be notified prior to burning. Smoke conditions are evaluated before, during, and after burning to minimize air quality impacts to the public. Additionally, under the proposed action managers would seek opportunities to divert fuels for biomass utilization. This would further reduce total emissions, as available biomass capable of producing emissions would decline.

1.13.6 Scenic Environment and the Recreation Opportunity Spectrum (ROS)

The proposed action has the potential to create changes in the scenic environment that may not meet public expectations or the visual objectives for the visually sensitive viewshed in the project area.

However, this project has been designed to maintain a natural-appearing setting for visitors traveling through or near the Forest. Forest Plan Visual Quality Objectives and visual concerns were addressed

when designing alternatives and project design features. The Recreation and Visual Quality Specialist Report (project record) provides additional detail regarding this issue.

The ROS will not change with the implementation of any alternative.

1.13.7 Climate Change

Recent rapid climate change has raised concern over the ability of some species to adapt to landscape changes associated with this phenomenon. Diaz and Eischeid (2007) found an average increase of approximately 1.0 degree Fahrenheit (°F) over the last 20 years in the western United States with the greatest increases at high elevations. Diaz and Eischeid (2007) contend that changes in annual shrub phenology (earlier flowering), increases in significant forest pest infestations, earlier spring runoff, intensified wildfires, and the disappearance of alpine and tundra ecosystems illustrate rapid changes in the hydrological, phenological, and biological indicators of western ecosystems that are a result of climate warming. Research findings (Gedaloff et al. 2005, Westerling et al. 2006) document increases in large western wildfires beginning in the mid-1980s and correlated climate variables, including increased spring and summer temperatures and early spring snow melt.

Climate data for the last 55 years (1951-2006) reveal that on average, temperatures in Idaho have increased 0.031 percent per year (Figure 1-2), and precipitation has increased 0.085 percent per year (Figure 1-3) (The Nature Conservancy 2011). Consistent with findings by Diaz and Eischeid (2007), the temperature increases have been more severe at higher elevations.

Restoration ecologists acknowledge that future climatic regimes may be different than the climatic regimes that developed historical representations of landscapes. However, Fule et al. (2009) argue that historical reference conditions remain useful in light of climate change evidence because historical forests were likely more resilient and resistant to drought, insect pathogens, and severe wildfire. Noss (2001) supports this approach and advocates that resilience and resistance are created by (1) maintaining a diversity of functional groups; (2) maintaining species richness and redundancy within functional groups; (3) identifying keystone species; and (4) maintaining keystone species at optimal, not just minimally viable, populations. This approach provides the best opportunity for species to adapt to changes. Noss (2001) also states that climate change is not the greatest threat to today's forests but is an additional stressor and suggests that restoring vegetative conditions will result in more adaptable forests.

The Lost Creek Boulder-Creek Project is designed to enhance resiliency to climate-related stressors such as drought, wildfire, insects, and disease. Moving vegetation toward desired conditions as described in Forest Plan, Appendix A (USDA Forest Service 2003) would decrease vulnerability of the vegetation and wildlife to climate change impacts and increase the adaptive capacity of the ecosystem elements.

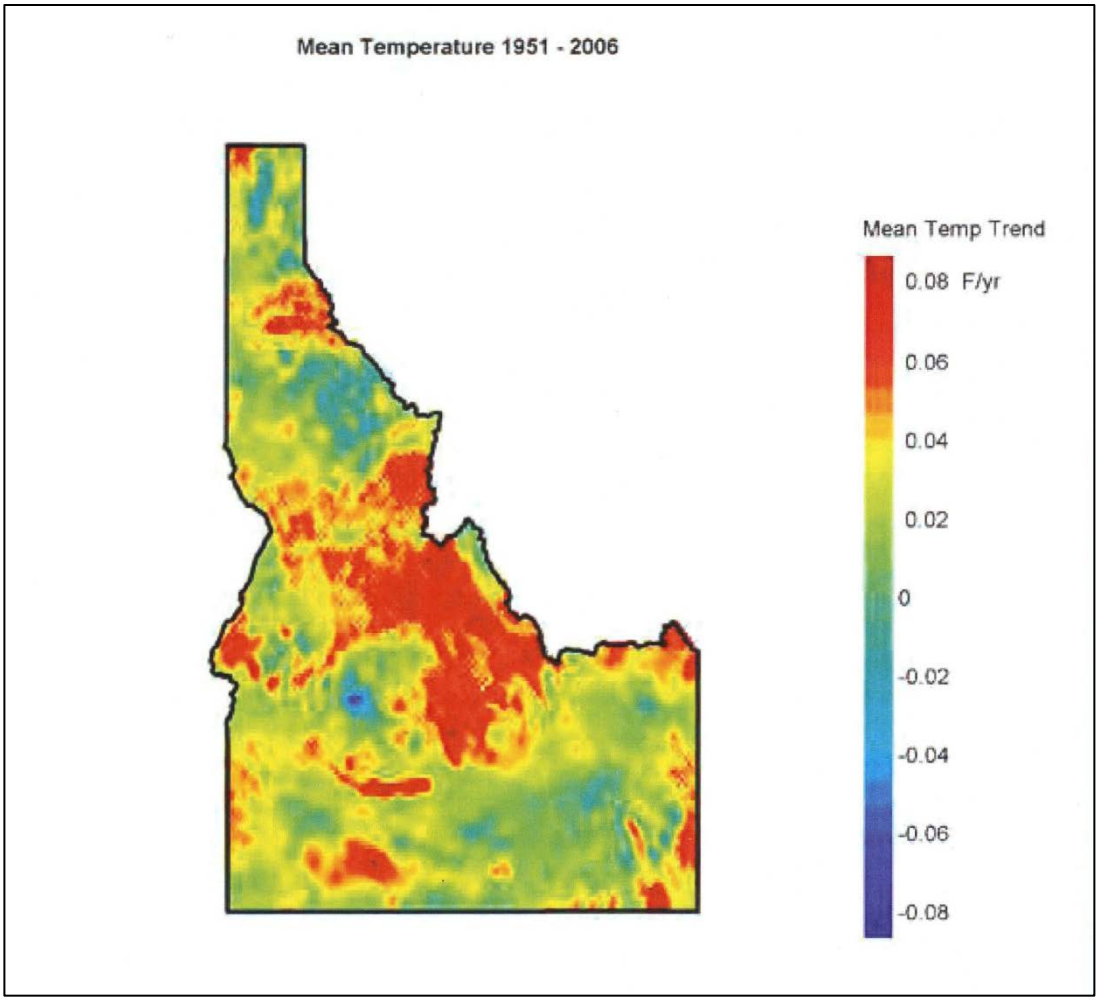


Figure 1-2. Average Temperature Changes for Idaho from 1951-2006

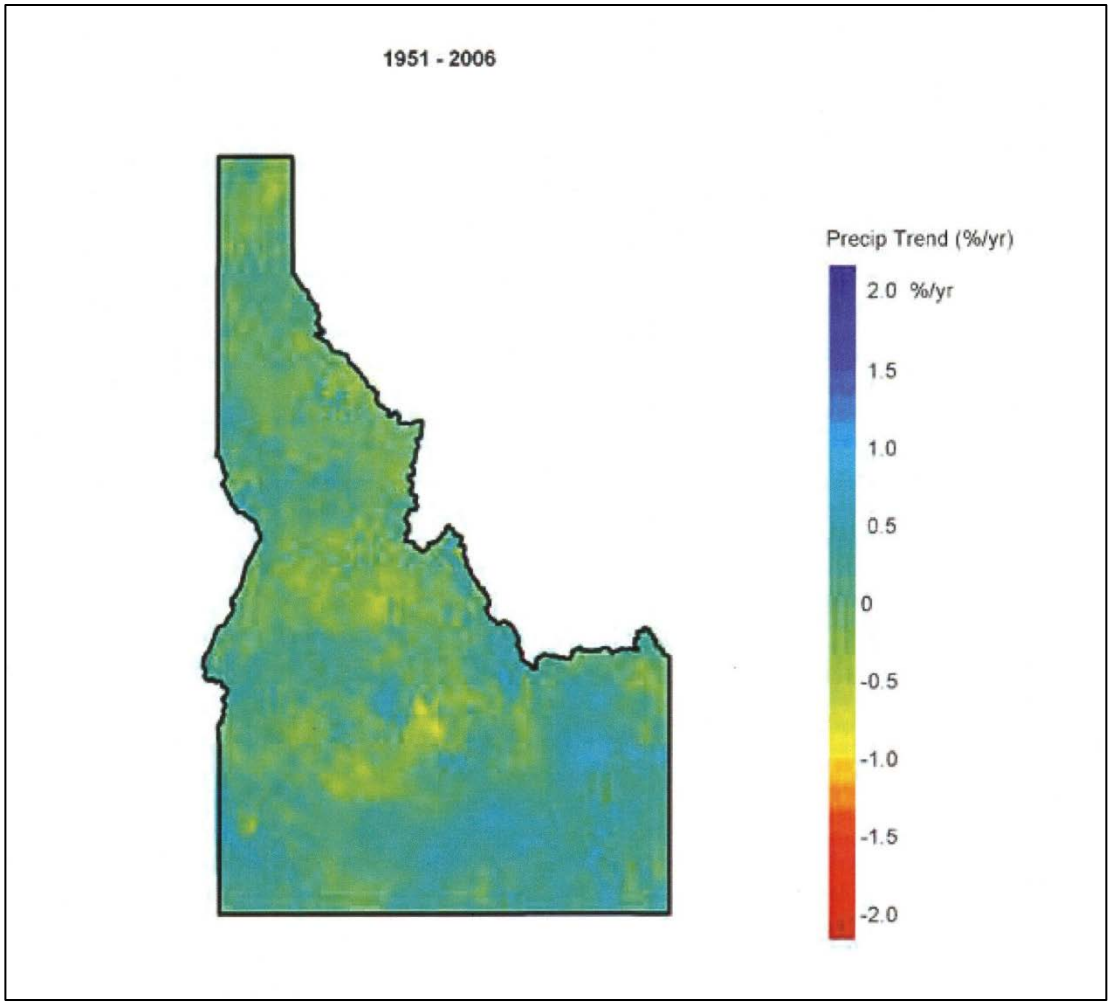


Figure 1-3. Average Precipitation Changes For Idaho from 1951-2006

1.14 Permits and Licenses

All proposed project activities would occur on National Forest System lands. Existing permitted uses of National Forest System lands would be protected during project implementation to the extent possible. The timber harvest portion of the project can be implemented through Forest Service timber sale contracts with project-specific provisions. Any work involving activities within a stream channel with live water, such as culvert installation as part of road improvements, would require a stream alteration permit (404 Permit) from the Idaho Department of Water Resources.

1.15 Legal and Regulatory Requirements

Legal and regulatory requirements associated with this project are located in Appendix F of this document.

1.16 Project Record and Specialist Reports

This DEIS incorporates by reference the project record (40 CFR 1502.21). The project record contains draft specialist reports and other draft technical documentation used to support the analyses and conclusions in this DEIS.

Incorporating by reference the specialist reports and the project record responds to the CEQ regulations implementing NEPA directing that agencies should reduce NEPA paperwork (40 CFR 1500.4), and that NEPA documents should be analytic rather than encyclopedic, kept concise, and no longer than absolutely necessary (40 CFR 1502.2). The objective is to furnish enough site-specific information to demonstrate a reasoned consideration of the environmental impacts of the alternatives and how these impacts can be mitigated, without repeating detailed analysis and background information available elsewhere.

Chapter 2. Alternatives

2.1 Introduction

This chapter describes the alternatives considered for the proposed project and summarizes the environmental effects of each alternative. It is intended to present the alternatives “in comparative form, sharply defining the issues and advocating a clear basis for choice among options by the responsible official and the public (40 CFR 1502.14)”. The Forest Plan, draft Wildlife Conservation Strategy, Payette National Forest Travel Management FEIS, input from public comments, and other applicable laws, regulations, programs, and policies related to natural resource and Forest management guided development of the alternatives.

Calculations of acres, miles, treatment unit boundaries, road and other features for this analysis are based on digital mapping. Actual on-the-ground values, boundaries and locations may vary slightly from the calculated values presented in this DEIS.

2.2 Alternatives

Section 102(2) (3) of the National Environmental Policy Act (NEPA) states that all federal agencies shall, "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflict concerning alternative uses of available resources." An environmental impact statement (EIS) must also "rigorously explore and objectively evaluate all reasonable alternatives." The courts have established that this direction does not mean that every conceivable alternative must be considered, but all selections and alternative discussions must permit a reasoned choice and foster informed decision-making and informed public participation.

The range of alternatives may extend beyond the limits set by Forest Plan goals and objectives under NEPA; however, the National Forest Management Act (NFMA) requires that the selected alternative fully comply with the Forest Plan unless the plan is amended in accordance with 36 CFR 219.10(f). The range of alternatives presented in this chapter was determined by evaluating external and internal comments and the purpose and need for this project.

2.2.1 Alternatives Considered but Eliminated From Detailed Study

The ID team considered but eliminated two alternatives from detailed study during this analysis. Although these alternatives contribute to the range of alternatives, they were eliminated from further consideration for the reasons described below.

1. The ID team considered an alternative that would combine more extensive watershed restoration work (as in Alternative C) with more extensive vegetative restoration actions (as in Alternative D). This alternative was eliminated because the decision maker can achieve the same results by selecting from or blending aspects of the different action alternatives.

2. The ID team considered an alternative that would maximize commodity production (timber harvest). The ID team eliminated this alternative because purely maximizing timber volume production would not be consistent with the purpose and need of the project, nor with Forest Plan standards and guidelines. In

addition, Alternative D and E are the ID team's attempt to increase the amount of commodity resulting from restoration efforts while remaining consistent with both the purpose and need of the project, the Forest Plan, and the science in the draft Wildlife Conservation Strategy.

2.3 Alternatives Considered In Detail

The ID team developed and analyzed in detail five alternatives, including the no action alternative, for the Lost Creek-Boulder Creek Project. In the narrative for the action alternatives, current information was used by the ID team to estimate values such as number of acres treated, road miles, and timber volume. On the maps of alternatives, prescribed fire, thinning and harvest unit locations and prescriptions are also best estimates based on current information. Some adjustments may occur during project design and layout to conform to on-the-ground conditions. In all cases, adjustments would only be made to meet the intent of the Purpose and Need and the Forest Plan.

2.4 Alternative A – No Action

Alternative A is the no-action alternative. Natural disturbances and current management of the project area would continue as before. The activities proposed for this project would not be implemented.

The NEPA requires consideration of the no-action alternative in any environmental document. This alternative serves as the environmental baseline for analysis of effects. Under Alternative A, current management of the area would continue as directed in the Forest Plan, and activities proposed in this document would not be implemented. No fire and fuels treatment, road or watershed improvements, access closures, fish and wildlife improvements, or vegetation management associated with this project would occur.

Firewood gathering, fire suppression, invasive weed treatments, road and trail maintenance and other routine forest management activities not associated with this decision would continue as before. Implementation of Alternative A would not meet the purpose and need for this proposal.

2.5 Alternative B - Proposed Action

Alternative B is the proposed action. It responds in part to the purpose and need as stated in Chapter 1 of this DEIS, and incorporates the recommendations of the PFC and recreation access concerns expressed in comment letters and public meetings.

2.5.1 Alternative B Vegetation Treatments

Vegetative treatments include: Commercial and Non-commercial Vegetative Treatments, Prescribed Fire, and Associated Actions. Vegetation treatments for Alternative B are displayed in Figure 2-1.

The Forest Service proposes to thin approximately 40,000 acres with commercial (approximately 22,000 acres) and non-commercial (approximately 18,000 acres) vegetative treatments in the project area. This acreage includes the treatments designed to benefit NIDGS and treatments within Riparian RCAs (see Appendix A). Of the acres proposed for thinning, approximately 1,800 acres are commercial treatments (as described below) within RCAs.

Proposed activities were developed utilizing a combination of data derived from aerial photo interpretation and field reconnaissance. Layout of exact boundaries and treatment types would be determined based upon additional on-the-ground surveys and vegetative conditions within each stand. Based on project design features and the intent of the proposed treatments, it is anticipated that further ground verification may result in a reduction of commercial treatments and a resultant increase in non-commercial treatments. The anticipated reduction in acreage of commercial treatments from proposed to the expected implementation acreages are based on the fact that further site specific verification of RCAs, landslide prone areas, harvest systems, economic viability/feasibility of commercial treatments, existing conditions, and other factors would preclude treating some of the proposed areas. Although all acres proposed for treatment would be evaluated for treatment based on the descriptions of treatments provided below, only acres that meet the intent of the treatment descriptions, are economically feasible, and consistent with the project design features, per alternative, would be treated. Therefore, total acres of commercial treatments are anticipated to be reduced by 10-40 percent from those proposed, based on field review of proposed treatments and actual implementation of similar previous projects on the Payette National Forest. Actual treatment unit boundaries are anticipated to vary from the GIS files and maps displayed in this document. The maps provided in this document are diagrammatic; actual unit boundaries and treatment units would be determined after further on the ground verification. Limitations such as slope, RCA boundaries, acres treated per 6th field watershed, and wildlife constraints would be applied during treatment unit delineation on the ground.

Commercial Treatments

Commercial vegetative treatments have been divided into the following categories: Commercial Thin-Free Thin (CT-FT - 12,200 acres); Free-Thin/Patch Cut (FT-PC - 1,800 acres); and Commercial Thin-Mature Plantations (CT-MP - 8,100 acres). Stands would be thinned through commercial logging. Harvested trees would generally be removed with the limbs and tops attached. The limbs and tops would be utilized as biomass, or other products, where practical. Where appropriate and needed, sapling sized trees would be cut to reduce ladder fuels and promote desired advanced regeneration where necessary. Following harvest, these stands could be underburned as described in the prescribed fire section below.

Commercial thin-free thin (CT-FT) - 12,200 acres. Free thinning would allow flexibility to use different thinning methods for varying stand conditions and objectives. For this project, free thinning would be accomplished primarily by low thinning (removing trees from the lower crown classes) with some crown thinning (removing trees from the dominant and co-dominant crown classes) and occasionally sanitation cutting to improve stand health by reducing the anticipated spread of insects or disease.

These treatments would generally be completed in forested areas dominated by mature, vigorous ponderosa pine, Douglas-fir and / or western larch (*i.e.* - PVG 1, 2, 5 and portions of PVG 6 dominated by early seral species) with canopy closures greater than 35 percent.

The purpose of CT-FT treatments would be to:

- Maintain and promote large tree forest structure while restoring the desired species composition, and stand densities;
- Promote forest health, reduce competition and improve growth rates for remaining trees;

- Improve habitat for wildlife species that require large tree and old forest stands with low to moderate canopy cover;
- Enhance NIDGS habitat in priority areas;
- Promote regeneration of desired tree species in areas that are conducive to uneven-aged silviculture systems (uneven-aged management would be considered in the drier forest types where successful regeneration of desired species is anticipated [*i.e.*, in ponderosa pine and Douglas-fir forest types]); and/or
- Reduce potential for crown fire spread given a wildland fire.

The specifications for this treatment include:

- Seral species (aspen, western larch, ponderosa pine, and/or Douglas-fir) would be favored to leave over non-seral species (*e.g.* grand fir) and preference given to retain larger diameter trees;
    - Trees greater than 20 inches diameter breast height (DBH) would generally be given preference for retention unless there is reason to remove these trees due to forest health, safety, or operational concerns.
        - Forest health concerns include:
            - dwarf mistletoe that cannot be isolated (and would cause mid- to long-term forest health issues),
            - basal area density over 120 feet^2 per acre, and
            - large diameter and/or vigorous western larch and ponderosa pine with direct crown/root competition from non-seral (grand fir or Douglas-fir) trees.
        - Safety concerns include hazard trees in and/or adjacent to campgrounds, dispersed campsites, and roads/trails open to the public.
        - Operational concerns include hazard trees, skid trails, skyline corridors, landings, etc.
- In large tree size class stands (generally stands that currently have eleven or more trees per acre that are 20 inches or greater DBH), retain at least eleven, 20 inch DBH or larger trees per acre. This may require retaining large diameter trees that do not meet the description for preference, above.
- Trees greater than 20 inches DBH not meeting merchantability specifications due to damage, poor tree form or indicators of rot should generally be retained to meet wildlife objectives. Retain large diameter western larch and ponderosa pine, regardless of crown separation, unless they do not meet dwarf mistletoe and crown ratio criteria. However, do not retain these trees if the basal area would be greater than 120 square feet per acre.
- Trees free of mistletoe would be favored over infected trees. When possible, trees with mistletoe ratings of 0-3 would be favored over trees with a rating of 4-6. When trees with mistletoe ratings of 4-6 could be isolated (*i.e.* - greater than 40 feet from uninfected host trees) while addressing

mid- to long term stand objectives these infected trees would be retained to meet wildlife objectives.

- Throughout the harvest area, clumps of trees, both commercial and non-commercial sized would be retained for wildlife and visual objectives (these would generally be prioritized in areas with existing snags).
- Small openings of less than two acres would be created in areas that are dominated by grand fir, low vigor trees, or diseased trees or in areas with high potential of aspen regeneration. Where aspen are present, conifers could be removed within the aspen stand to improve the integrity of these stands. These openings should not generally exceed 10 percent of a stand.
    - Small openings of up to two acres may be utilized to stimulate aspen regeneration. In aspen patches, coniferous trees would be removed within 50 feet of the aspen patch. To be considered an aspen patch, an area must have an average spacing of less than 20 feet between stems and be larger than 1/10 acre in size.
    - Exceptions: A minimum of 5-10 trees per acre would be left in these openings, with leave tree preference given to western larch, ponderosa pine and Douglas-fir legacy trees and vigorous serals (*i.e.*, – ponderosa pine, western larch, and aspen) in the dominant and co-dominant crown classes and secondary preference given to dominant non-seral trees. Artificial regeneration may be prescribed in patches between one and two acres if no suitable seed trees are present.
- Large diameter ponderosa pine and western larch would be "day-lighted" or thinned around to reduce ladder fuels and competition for resources. This would generally be accomplished by following the general marking guides. However, if these trees occur in the uncut patches left to limit the size of the created regeneration openings noted above, these trees should be "day-lighted". To "day-light" these trees, all sapling and pole size trees and trees that do not meet the general retention standards within 15 feet of the dripline of the large diameter trees should be cut. Healthier trees are favored as leave trees over diseased trees. Trees with higher crown ratios, good form, and other indicators of vitality would be favored as leave trees.

Following treatment, these stands would be a mosaic of thinned areas, clumps of trees, and small openings. The average canopy closure in these stands after harvest and underburn operations would be between 25 and 45 percent. In mature stands, this equates to an average crown spacing of approximately 6 to 20 feet. Lower canopy cover (25 to 30 percent post treatment canopy cover) would generally be targeted in PVG 1 and 2. This equates to 10 to 20 foot crown spacing. Whereas higher canopy cover (30 to 45 percent) would generally be the desired post treatment desired condition in PVGs 5 and 6. This equates to 6 to 15 foot crown spacing. Portions of stands with natural openings and heavily thinned areas would have less canopy closure, perhaps as low as 10 percent. These openings would eventually develop more canopy closure where seedlings establish and grow. NIDGS treatment areas may have canopy closure reduced to 15-30 percent. In mature stands, this equates to an average crown spacing of 12 to 30 feet. Stands within goshawk post fledgling areas may have specific requirements that are different from these general guidelines. These stands will be identified prior to marking operations and will be designed to meet (GTR 217).

Free Thin–Patch Cut (FT-PC) - 1,800 acres. This treatment would be implemented in relatively cool, moist grand fir forest types that have evidence (*i.e.*, - relic early seral trees, stumps, snags, etc.) of previously having an aspen, ponderosa pine, western larch and/or Douglas-fir component. The treatment would occur in stands that still have a component of early seral species (*i.e.*, – 25 to 75 percent of the desired amounts) but not enough to free thin throughout and still leave the desired species composition.

Implementation of this treatment would allow for regeneration (patch cut with reserves) in patches ranging from three to ten acres in size, generally on less than 50 percent of a stand. In regenerated areas (patches) approximately four to twelve trees per acre would be retained as reserve trees. The stand would be either naturally or artificially regenerated after treatment.

Reserve tree preference would generally be legacy western larch and ponderosa pine, when available. In the absence of desired legacy trees, preference would be given to dominant non-serals and vigorous serals in any crown class. Artificial regeneration (planting trees) would be utilized in areas where the desired species composition would not be expected to be met with natural regeneration.

In portions of stands with an early seral component still remaining, free thinning would be implemented as described above. Portions of each stand not meeting the criteria for patch cuts or free thinning would not receive commercial treatment during this entry.

Commercial Thin / Mature Plantations (CT-MP) - 8,100 acres. This treatment would be applied to stands that were previously artificially regenerated (plantations). These stands are typically greater than 30 years in age and were planted predominately with ponderosa pine, Douglas-fir, and/or western larch. These mature plantations contain commercial trees with an average diameter at breast height (DBH) greater than eight inches and would average approximately 70 to 80 trees per acre (this would generally result in crown spacing of 10-15 feet) after thinning. Thinning would generally favor the retention of larger, early seral trees and be completed to create stands with variable densities while promoting a mix of desired species. Merchantable material would be removed from the site and utilized as markets allow. Non-commercial material (slash) would be lopped and scattered, mechanically harvested, hand piled, machine piled, and/or broadcast burned to reduce fuel loading. The cost of slash treatment, coarse woody debris, and fuel loading would be considerations in determining the method of non-commercial material treatment.

Commercial Thin within RCA's-Both thinning and prescribed fire treatments are proposed in the RCAs. Thinning and prescribe fire treatments in RCAs are not proposed in the Boulder Creek subwatershed (see Appendix A for further information on treatments in RCAs). Approximately 1,800 acres of CT-FT and CT-MP treatments have been proposed in areas dominated by drier forest types historically maintained by frequent, low intensity fire regimes to maintain upland vegetation within the historic range of variability. These acres are not additional acres of proposed treatment. These 1,800 acres is already accounted for in the CT-FT and CT-MP section, above. Only areas in the outer half of RCAs have been proposed for this treatment and the CT-FT and CT-MP treatment descriptions would be modified in these areas to retain adequate stocking to achieve shade and large woody debris recruitment objectives within RCAs.

Commercial thinning treatments are intended to move upland vegetation within RCAs toward the desired conditions described in the Forest Plan (Forest Plan, pgs. III-30, A-15) while maintaining soil, water, riparian and aquatic resources. Proposed treatments have been designed to mitigate potential activities that could degrade current RCA conditions or retard the attainment of SWRA desired conditions. All RCA treatments would apply only to upland vegetation that occurs within the outer portion of a RCA, and not to riparian vegetation (*i.e.*, – willow, spruce). These actions, based on further site specific analysis, are

consistent with direction for upland vegetation desired conditions and RCAs in Forest Plan Appendices A and B (USDA Forest Service 2003).

RCA treatments would remove less than 20 percent canopy cover and would be developed in consultation with the district fish biologist and/or hydrologist to ensure streambank stability and ground cover are considered and riparian functions are maintained.

In portions of RCAs where commercial thinning treatments would not be feasible or deleterious effects to riparian functions and ecological processes (described in the Forest Plan, page B-37) are anticipated, the unit (or portion(s) thereof) would be excluded from treatment.

Generally, ground disturbing activities in RCAs would be avoided. Due to the site-specificity of each proposed RCA treatment unit, a map and description of the layout of the RCA portion of the unit would be provided to the District fisheries biologist and, hydrologist,(or qualified designees) for field verification. A site-specific plan would be approved by a District hydrologist and fisheries biologist prior to implementation. See management requirements and project design features (Tables 2-4 and 2-5) for more detailed descriptions of mitigation measures and management requirements.

Non-commercial Treatments

Non-Commercial Thinning – 18,000 acres. Non-commercial thinning would be completed in plantations that currently have density-related stress occurring. This constitutes approximately 1,700 acres. These plantations are generally less than 30 years old and have an average DBH of less than eight inches. Within these plantations, thinning would be completed to improve wildlife habitat, increase growth rates and tree vigor, improve stand resiliency to natural disturbance, and reduce density-related competition. Post treatment, these stands would retain approximately 80 to 100 trees per acre. Thinning would favor early seral species but would retain a mixture of species and variable densities depending upon site specific objectives. Where reserve trees within plantations receiving this treatment are causing forest health problems (primarily due to mistletoe) trees may be killed by girdling. Girdled trees would be marked with wildlife tags as necessary to meet desired snag numbers and sizes.

In addition to the above mentioned plantation thinning, ladder fuel thinning would occur on 16,000 acres. All acres targeted for the application of fire would be evaluated for ladder fuel thinning in order to minimize mortality from prescribed fire and aid in moving towards restored conditions. This ladder fuel thinning may occur within plantations to minimize prescribed fire-related mortality.

Non-commercial thinning would generally cut trees less than eight inches DBH and prune residual trees, when practical, up to six feet in height. In areas targeted for prescribed fire treatments (see below) non-commercial thinning would be completed where necessary to:

- Expand the opportunity for application of prescribed fire by changing the fuel profile;
- Reduce the potential for undesired fire effects (*i.e.*, mortality of legacy trees);
- Aid in the retention of desired leave trees;
- Reduce non-commercial tree densities, increase growth rates, improve wildlife habitat, and tree vigor.

Ladder fuel thinning would be permitted within RCAs where active ignition is anticipated. All ladder fuel treatments in RCAs will be completed by hand and would not cut trees larger than eight inches DBH. Slash

produced from ladder fuel treatments would be lopped and scattered or hand piled. Piling of slash would not occur within RCAs. See Project Design Features for further description of measures to ensure that activities do not degrade or retard soil, water, riparian, or aquatic desired conditions.

Associated Actions

A number of activities associated with implementing these vegetative treatments are necessary. These include:

Road Maintenance and Use - Road maintenance may include, but is not limited to, blading, installation of drainage features (*i.e.* – rolling dips), hardening soft spots (*i.e.* - utilizing pit run), installing or improving water passage (*i.e.* – culverts), realignment of small segments of roads to minimize impacts to resources, brushing roads to improve visibility and safety. Additional system roads may be utilized with approval by district hydrologist and/or fisheries biologist (or qualified designees). System roads currently in long-term closure may also be reconstructed and used for implementation of the project. Use of these roads may involve the installation of stream crossings that were removed as part of the long-term closure treatment.

Temporary roads - Both planned and incidental temporary roads would be utilized and decommissioned after project implementation. Planned temporary roads are defined as routes identified during the planning process and depicted on project maps as such. Approximately 30 miles of planned temporary roads would be used. Incidental temporary roads are roads that are needed to complete vegetative treatments but cannot yet be identified due to the level of site-specificity necessary. These incidental temporary roads would be located on existing roadbeds (unauthorized roads) that are proposed for decommissioning, when possible, and where other resource concerns could be mitigated. Incidental temporary roads would require approval by resource specialists prior to construction.

Gravel Pits – Seven gravel pits will be utilized within the project area in order to provide gravel for resurfacing roads. All of the gravel pits have suitable rock for present and foreseeable future expansion needs. Activities in the pits will be coordinated with the Wildlife Biologist for any restrictions or constraints for protection of wildlife. Expansion of the gravel pits outside of the existing disturbed area will require additional coordination with resource specialists such as heritage, botany, and wildlife. Alternate pit locations may be considered when the impacts of developing a new rock source would be less or equal to using an existing source. Further description of the gravel pits and their locations is located in Appendix F, *Road Management Actions*.

Harvest Systems- Merchantable trees would typically be cut with feller-bunchers on slopes less than 45 percent or by personnel with chainsaws on slopes greater than 45 percent. Harvest systems may include ground based, skyline, and helicopter. Generally, ground based systems (tractor, jammer, etc.) would be utilized on slopes less than 45 percent slope where road access is available, skyline systems would be used on slopes greater than 45 percent where road access is available, and helicopter systems would be utilized where ground based or skyline systems are not feasible and economically viable. Current estimates indicate that helicopter systems would not be economically viable. Actual harvest system in each unit would be determined upon field verification with limitations of the amount of each harvest system that could occur in each subwatershed. Existing skid trails would be reused when practical and new skid trails would be authorized where necessary. All skid trails would be obliterated and recontoured after project completion to mitigate resource concerns.

Brush Disposal- After thinning, slash reduction would include machine piling and burning, hand piling and burning, lop and scatter, broadcast/underburning, or removal. This applies within and outside of areas designated for prescribed fire treatments. Opportunities would be sought for removing and utilizing the biomass for energy production or other uses when practical.

Site Preparation – After the harvest activities are completed and prior to planting in patch cuts, site preparation may be completed either by prescribed burning, hand scalping or mechanical scalping (exposing mineral soil) with heavy equipment. This would be completed to reduce competition to seedlings from brush and grass. This applies within and outside of areas designated for prescribed fire treatments.

Planting – Planting of ponderosa pine, western larch and/or Douglas-fir seedlings on all acres that had patch cuts would be completed as necessary to meet desired stocking levels.

2.5.2 Alternative B Prescribed Fire Treatments

Approximately 45,000 acres of the project area would be targeted for prescribed burning over the next 15-20 years (see Figure 2-2). In stands where commercial activities are proposed the application of fire would generally occur after commercial activities are complete. Re-introducing 500 to 10,000 acres of fire annually for the next 15-20 years would move forested and non-forested vegetation towards conditions that more closely represent historic distribution, structure, and function, and would move the project area towards desired conditions as described in Appendix A of the Forest Plan.

A mosaic-like application of fire would re-introduce fire to approximately 75 percent of primary targeted acres, and 50 percent of secondary targeted acres.

- Primary target acres for treatment consist of stands with historically high fire frequencies and lower severities (grasslands and stands dominated by seral species such as ponderosa pine, Douglas-fir, and western larch);
- Secondary target acres include stands with historically moderate fire frequency and mixed severities stands composed of both seral and non-seral species (*i.e.*, grand fir);
- Fire would not be directly applied to non-target areas. These stands are composed of young plantations, stands of historically low frequency and high severities, and stands set aside for other resource concerns or objectives (*e.g.*, wildlife cover). Approximately 20 percent of non-target acres within the project area can be expected to receive fire, through backing (low intensity fire spread, without additional lighting). This minimal fire spread would not alter overall stand conditions within the non-target areas.

Existing barriers to fire spread (natural and human-caused, from streams and barren ridgelines to roads and trails) would be used where possible to contain prescribed burns within specified boundaries. In areas where existing barriers are insufficient to control fire spread, fireline would be constructed. Hand-constructed fireline would be limited to use only where necessary. The integrity of existing trails and roads would be considered in the application of fire and damage caused by these actions would be repaired. Constructed fireline would be rehabilitated after use.

Ignitions would be by hand or helicopter. Prescribed burning operations may occur from early spring to late fall. Fire may be applied to tree wells in winter or early spring to reduce fuel accumulation and reduce the potential for tree mortality during regular broadcast burning. Maintenance burning (burning after initial

application of fire) would occur every 5-10 years to maintain suitable NIDGS habitat and areas representative of high frequency fire regimes. Prescription parameters (wind speed, fuel moisture, smoke dispersion, and other resource area objectives) influence burn opportunities. Ignitions within some RCAs would be permitted, with some restrictions and approval by district resource specialists.

No direct ignitions of prescribed fire would occur within RCAs in the Boulder Creek subwatershed. In the remaining portions of the project area, ignition operations within RCAs would be implemented to maintain RCA function and processes by creating a mosaic of burned and unburned areas, minimizing severity and intensity; maintaining stream-shading vegetation; retaining adequate ground cover and sediment filtering capacity; and maintaining current and recruitable large and coarse woody debris. In RCAs identified for treatment, no ignitions within 120 feet of perennial stream channels or within 60 feet of intermittent stream channels would occur. Direct ignitions could occur anywhere within RCAs if needed to contain fire spread. Ignition operations should generally occur in the outer portions of RCAs in the drier PVGs where fuels reduction is needed to increase the resiliency of the RCA and reduce the potential for high intensity/severity wildfire. If any areas are not capable of carrying fire or maintaining RCA function and processes (as described above) at the time of fire application, fire would not be applied.

All burning would follow Forest Plan Standards and Guidelines, and adhere to national and state air quality regulations. Specific conditions under which burning would occur would be developed through a prescribed fire plan, prior to ignition. Burn plans would be reviewed by district resource specialists prior to implementation.

2.5.3 Alternative B Watershed Improvement and Restoration Treatments

System Road Treatments

Road treatments proposed for this project were developed using the Travel Analysis Process (TAP) conducted in 2012 (USDA Forest service 2012). Changes to the Forest System Road network are proposed to reduce overall road density and minimize road-related impacts to water quality, wildlife and fish habitat. The intent is to improve the Boulder Creek subwatershed watershed condition framework (WCF) condition class from Impaired Function to Functioning at Risk (USDA Forest Service 2011).

Roads that are recommended to remain on the landscape as part of the Minimum Road System (MRS) would be maintained and improved to reduce sediment production (guided by recommendations from site-specific sediment modeling). Fish passage would be improved at crossings throughout the project area by replacement or removal depending on the proposed road treatment (*e.g.* a barrier identified on a road proposed for decommissioning would be removed, whereas a barrier on a road proposed to remain on the system would be replaced with an appropriate structure). Forest system roads not needed for future management or access and unauthorized routes are identified for decommissioning.

Approximately 60 miles of Forest system road would be placed in Long Term Closure status (Maintenance Level 1) and approximately 70 miles of Forest system roads would be decommissioned (Figures 2-3 and 2-4). Most of the system roads proposed for treatment are not currently open to the public. Currently 265 miles of road are open to motorized use within the project area; the proposed action would not appreciably change motorized access.

Unauthorized Route Treatments

All unauthorized routes not needed for future management would also be evaluated for some level of restoration treatments. The exact locations of the unauthorized route treatments have not been determined at this time, but will be defined in the FEIS and Record of Decision. It is anticipated that 90 miles of unauthorized roads across the project area would be treated. The following would be used to determine which routes would receive treatments.

a. Decommission any unauthorized routes that are utilized as temporary roads for vegetation management activities.

b. Decommission all unauthorized routes that are collectors to system roads identified for decommissioning or long term closure.

c. Decommission all unauthorized routes where there is evidence of unauthorized motorized use.

d. Decommission all unauthorized routes categorized as High Priority. High Priority indicates adverse soil, water, aquatic, and/or terrestrial resource impacts.

e. Decommission all unauthorized routes where stream crossing culverts or fills have not been removed from past actions.

f. Decommission all unauthorized routes where a large percentage of the route is within a riparian or landslide prone area

The Forest Service proposes to decommission approximately 30 miles of Forest system road and at least 12 miles of unauthorized route within the Boulder Creek subwatershed (an ACS priority). This road decommissioning is designed to improve Boulder Creek subwatershed from “Impaired” to the “Functioning at Risk” condition class. Road densities in the remaining subwatersheds would be reduced toward the desired condition, but would likely remain in the “Impaired” category. Table 2-1 describes the proposed restoration treatments for each of the subwatersheds in the project area (see also Figures 2-3 and 2-4).

Road relocation and re-routes

PL 111-11, Omnibus Public Land Management Act of 2009, Title IV--Forest Landscape Restoration, Sec. 4003 (b) (1) (F) requires that the CFLR projects not include the establishment of permanent roads. Temporary roads constructed for restoration treatments need to be decommissioned. Existing roads can be decommissioned, maintained, and re-constructed (including minor re-routes) where the purpose of the activity is to reduce ecological impacts from the road and to facilitate achievement of landscape strategy objectives.

The two road relocations in the Upper Weiser River subwatershed involve new road construction where there is not a current roadbed. Road construction to connect 51478 to 51482 would re-locate 51479 outside of the RCA. Road construction to connect 51480 to 51483 would relocate 51484 outside of the RCA. One road re-route in the Boulder Creek subwatershed would connect FS 51255 to FS 50079 by reconstructing an existing unauthorized route. This re-route would allow decommissioning of FS 50662 and FS 50131 while providing road access to the area for vegetation management.

Table 2-1. Proposed Road Treatments by Subwatershed

Subwatershed	Existing System Road Miles/ Mapped Unauthor-ized Routes	System Road Decomm. Miles	Move to Long Term Closure (Currently closed to the public)	Fish Passage Barrier Improvement	ATV Trail Conversion (currently seasonally open road)	Restoration of Unauthoriz-ed Routes (miles)	New Road Miles (Relocation of decommissioned road)	Change to Motorized Access (miles)
Boulder Creek	93/22	30	<2	16	0	12	0.5	- 1.0
Lost Creek	183/73	21	35	11	12*	40	0	+ 3.8
Lower West Fork Weiser	7/<1	<1	0	0	0	0	0	- 0.4
Upper West Fork Weiser	115/32	9	10	7	0	20	0	-0.5
Upper Weiser River	75/40	10	13	6	0	18	1.0	+0.1
Total	473/167	70	60	40	12*	90	1.5	+2.0

*Would also include conversion of approximately two miles of unauthorized routes to ATV trail.

Fish Passage/Habitat Connectivity

Improvements to fish passage, especially in the Boulder Creek subwatershed, are needed to address the purpose and need of the project. Sixteen crossings have been identified as important fish passage barriers in the Boulder Creek subwatershed in streams occupied by ESA-listed fishes or in Designated Critical Habitat (DCH). These crossings have been rated as either a Priority 1 (within a stream occupied by listed fish species or in DCH with abundant suitable upstream habitat) or Priority 2 (within DCH or suitable habitat for TES and desired fish species) for replacement (see Figures 2-3 and 2-4).

In the Boulder Creek subwatershed, this project proposes replacement of 11 of these crossings with appropriate structures (the remaining five barriers would be removed with the proposed road decommissioning). Additional stream crossings are present in the Boulder Creek but are not proposed for replacement in this project.

Outside of the Boulder Creek subwatershed, an additional 24 road-stream crossings have been identified in the Lost Creek, Upper West Fork Weiser River and Upper Weiser River subwatersheds on larger streams and major tributaries as a Priority 2 for potential replacement to improve fish passage. Although additional barriers are present in all subwatersheds on unnamed and intermittent stream channels, this project will focus on mainstem fish-bearing streams and tributaries. None of the subwatersheds outside of Boulder Creek are recognized as ACS watersheds or contain ESA-listed fishes. Crossings should be replaced as road work and project activities occur in these areas to improve habitat conditions for desired native fish species, and improve hydrologic connectivity in those subwatersheds.

Road Maintenance and Travel Management

System roads identified to remain on the landscape as part of the reduced MRS would be maintained and improved (see Figures 2-3 and 2-4). Activities designed to reduce sediment production in the Boulder Creek subwatershed would be guided by site-specific sediment modeling (Geomorphic Road Analysis and Inventory Package (GRAIP); http://www.fs.fed.us/GRAIP/). All closed Maintenance Level 1 Forest System roads would receive appropriate long-term closure treatments including culvert removal, installation of drainage features, and establishment of vegetation to reduce erosion to make them self-maintaining. All roads identified as not open to the public would receive an effective closure device (such as a gate, berm, or other closure device).

2.5.4 Alternative B Recreation Improvements

Boulder Creek

Trail maintenance and trail relocation to improve watershed conditions by repairing erosion problems along the trails (due to lack of trail maintenance and poorly located portions of some trails) are the focus of recreational improvements proposed in Boulder Creek (see Figure 2-5). Additionally, old pit outhouses would be removed and the sites would be restored.

The Lost Creek-Boulder Creek Landscape Restoration Project would:

1. Perform heavy maintenance on all existing Forest Service system trails within the Boulder Creek subwatershed to improve them to Forest Service Trail standards, including closing one trailhead and improving one trailhead. Specific trail work would:

a) Improve the Pollock Trail #179 trail tread where it crosses FS Road 51251; remove the old road culvert from the Road 51251/Trail #179 junction; install new trail signs at all trail junctions and where the trail crosses roads; remove the deteriorated horse ramp from the Chokecherry Flat junction (Road 50158/Trail #179 junction); complete a trail re-route between Chokecherry Flat and the #178 Rapid Ridge Trail junction to avoid steep and rocky terrain.

b) On #181 Cow Camp Trail, move the trailhead to the Pollock Trailhead (where there is abundant parking for horse trailers and vehicles) and construct a ½ mile trail from the Pollock Trailhead to connect into the Trail #181 trail about ½ mile up the 181 trail; add an educational kiosk to promote certified weed free hay only, and monitoring to ensure invasive species introduction and establishment does not occur; repair the bog crossing with a wooden boardwalk; complete blasting of rock and a short re-route at the Squirrel Creek crossing, and complete brushing along the entire trail length; decommission the Cow camp ½ mile of trail which is no longer needed and move the signs to the Pollock trailhead /new trail junction.

c) On Indian Springs Trail #184, install a trail sign and construct a 2-3 vehicle pull-out for parking along FS Road 50074; complete reconstruction work on the switchbacks located below the Chokecherry Flat Road 50158.

d) On Rapid Ridge Trail #178, complete heavy trail maintenance, and focus on work needed to repair damage to the trail tread caused by the 2012 Wesley Fire

2. Decommission the Ant Basin #324 trail head, 0.9 miles of Trail #324 (non-motorized trail) that accesses the #178 trail, close and decommission a short segment of Forest Road 50079 that access the trailhead and would no longer be needed. Relocate all trail use to the larger, better located Ant Basin South #519 trail; improve FS Road 51254 (which accesses the Ant Basin South Trailhead and #519 motorized trail); construct trailhead parking at the Ant Basin South trailhead, which would accommodate up to four horse trailers/trucks and an additional two passenger vehicles at one time; provide a turn-around for trucks with trailers and install a single vault restroom, and two metal hitch rails for stock.

3. Decommission and remove five wooden pit outhouses located along FS Road 50074 road in the Boulder Creek subwatershed and rehabilitate the sites. These outhouses are no longer useable.

Lost Creek

Specific to recreation in Lost Creek Subwatershed, the Forest Service proposes to (see Figure 2-6):

1. Install three, 3-panel entrance/information kiosks at the primary entry points to the reservoir. The middle panel on each kiosk will have a large scale map of the reservoir area that displays where dispersed camping using a vehicle is allowed, new OHV trail opportunities, vault restroom locations, developed camping opportunities (Cold Springs Campground), and the areas where the Forest Service is promoting personal self-contained toilets for camping use.

2. Install six single vault toilets around the reservoir in the most popular dispersed camping areas; promote the use of self-contained portable toilet units, (similar to what river users carry) in dispersed camping areas outside the immediate reservoir area; remove and decommission one remaining wooden unusable pit toilet located adjacent to the dam.

3. Identify and sign one main access road into the larger dispersed sites located along the west side of the reservoir, improving the entrance roads where needed to bring them up to road standards for level 2 roads; close and rehabilitate the multiple access routes into these dispersed camping sites.

4. Designate 68 (with signing, barrier rock and some pole fencing) desired dispersed campsites to retain; harden (gravel) and install barrier rock and fencing to define the boundaries of the larger sites to avoid perpetual and continued growth of the camping sites/areas; sign the access into these sites from main roads and sign individual dispersed campsites; add fire rings to some of the larger identified dispersed camping sites. Dispersed camping using a motorized vehicle will be restricted to designated sites only on Forest Road 089 road surrounding the Lost Valley Reservoir.

5. Complete closure and restoration of 12 undesired camping sites too close to the reservoir and/or those with poor access or near riparian areas.

6. Perform road to OHV trail conversion on 13 miles of closed roads and open seasonal roads. Identify an additional 7 miles of road to OHV trail conversion between draft and final EIS. The proposed 13 miles are located directly south of Lost Valley Reservoir. The OHV trails would be open to vehicles 72 inches – 84 inches in width and designed to meet Trail Class 2 standards for Four-wheel drive vehicles greater than 50 inches in width, as defined in FSH 2309.18 – Trails Management Handbook, Chapter 20. These standards have a design tread width of 72 inches – 84 inches, are on native material with limited grading, with structures minimum width being 96 inches.

Upper West Fork Weiser, Lower West Fork of the Weiser and Upper Weiser

No new recreation facilities are planned at this time for these subwatersheds.

Public Access

Under Alternative B, approximately 255 miles of open road would be available within the entire project area for public access for recreation opportunities including, but not limited to hunting access, fire wood gathering, berry picking, scenic driving, and dispersed camping in designated sites along the open roads.

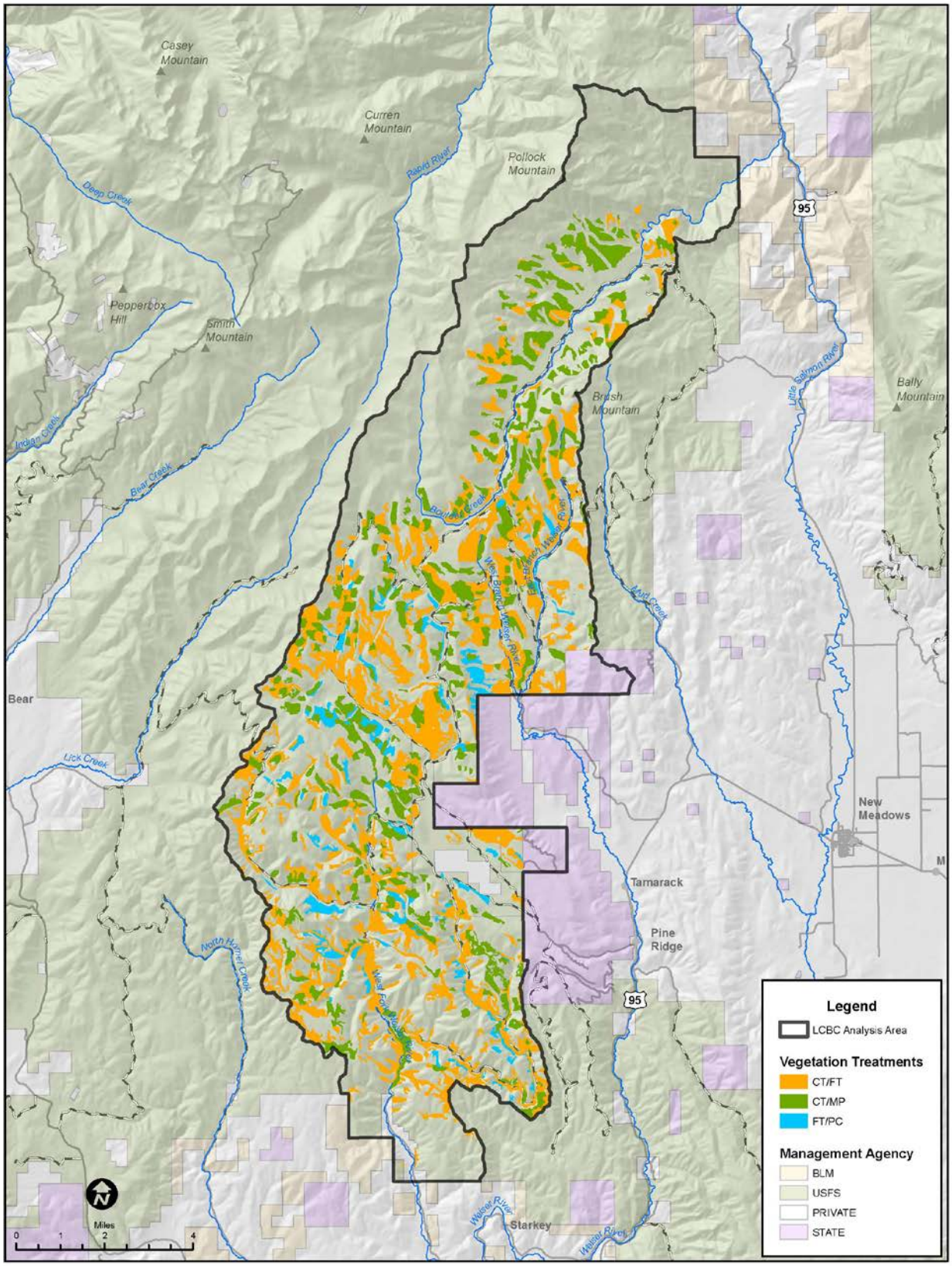


Figure 2-1. Alternative B Vegetation Treatments

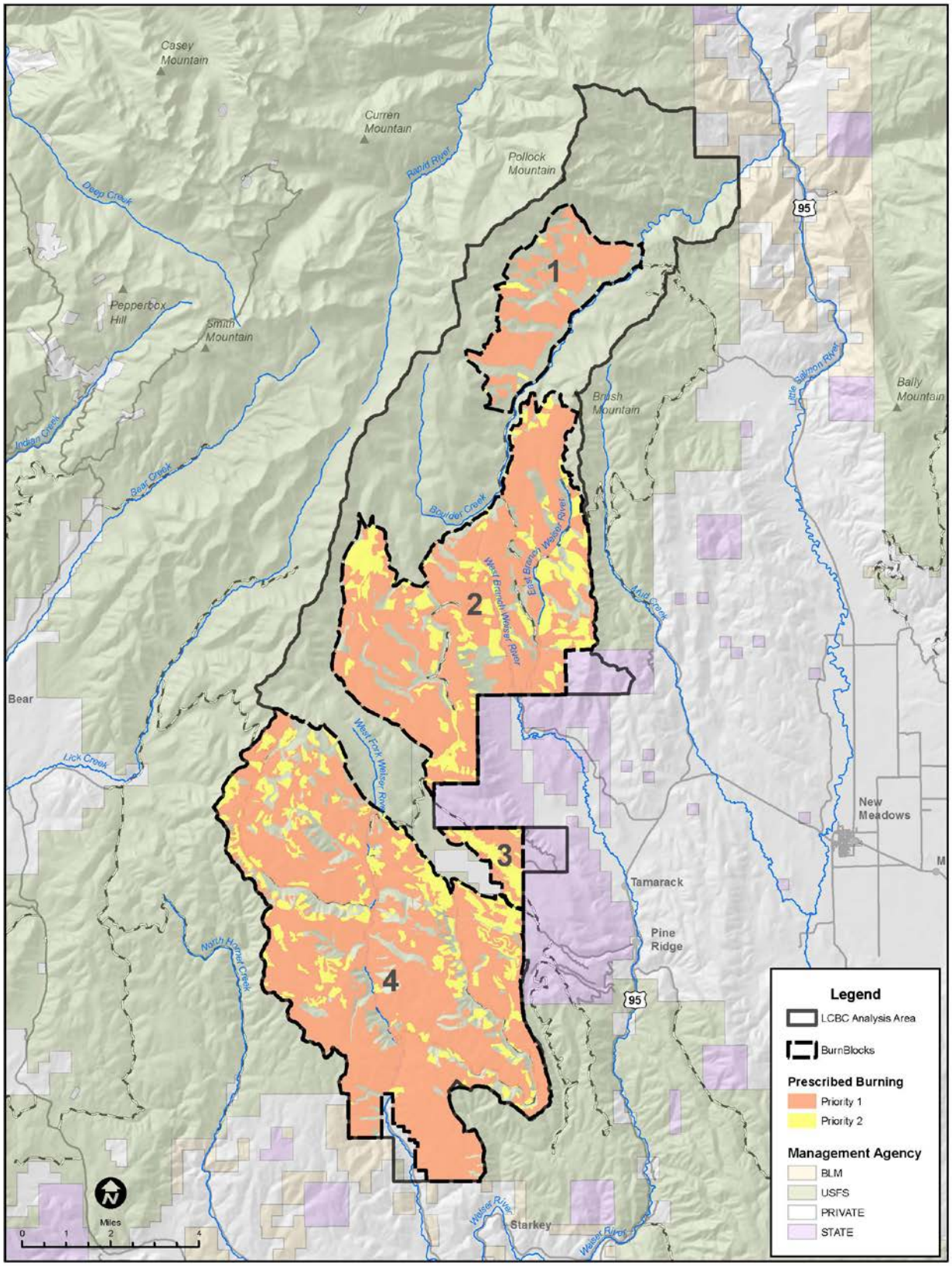


Figure 2-2. Alternative B, C and D Prescribed Fire Treatments

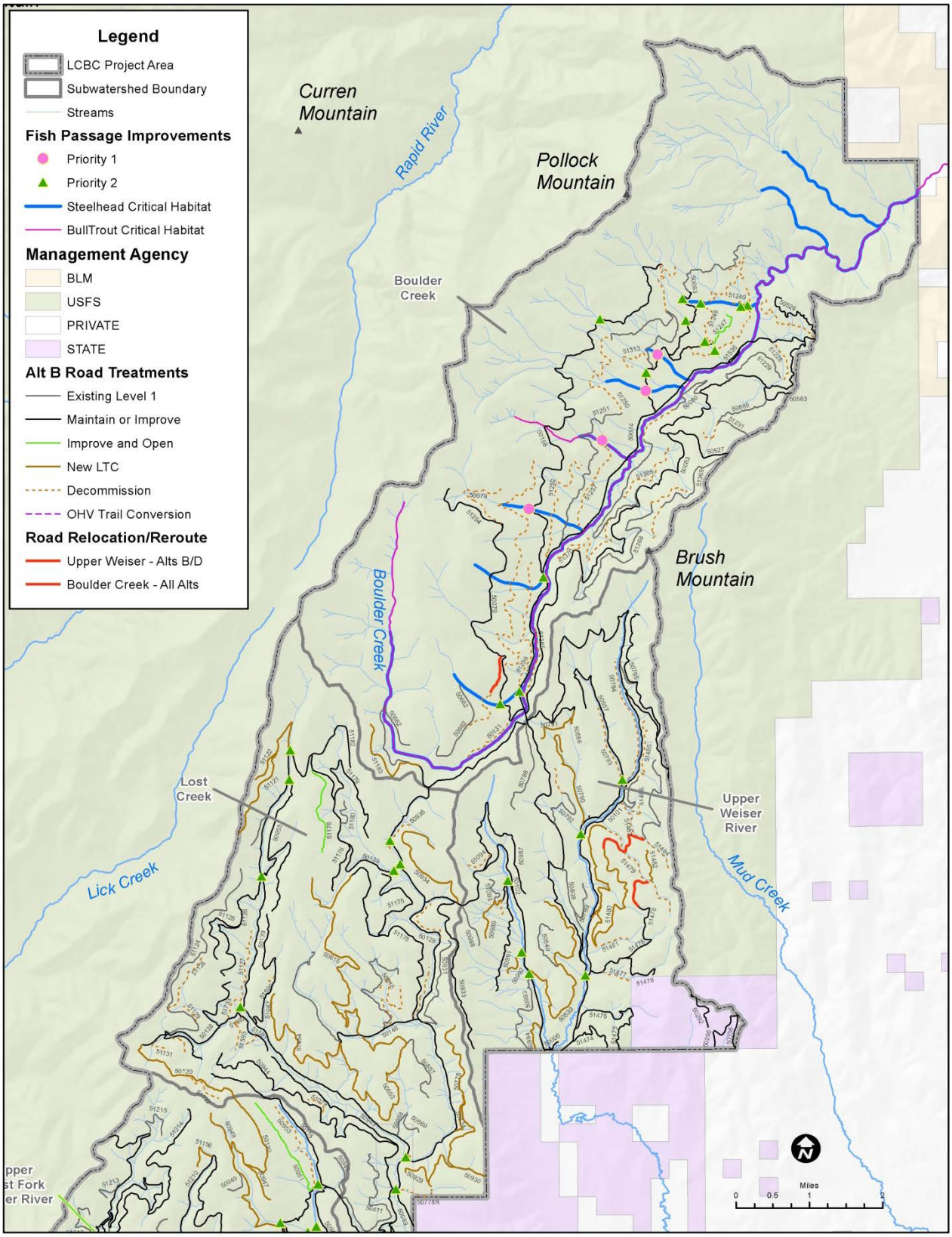


Figure 2-3. Alternative B Watershed Restoration Treatments, North

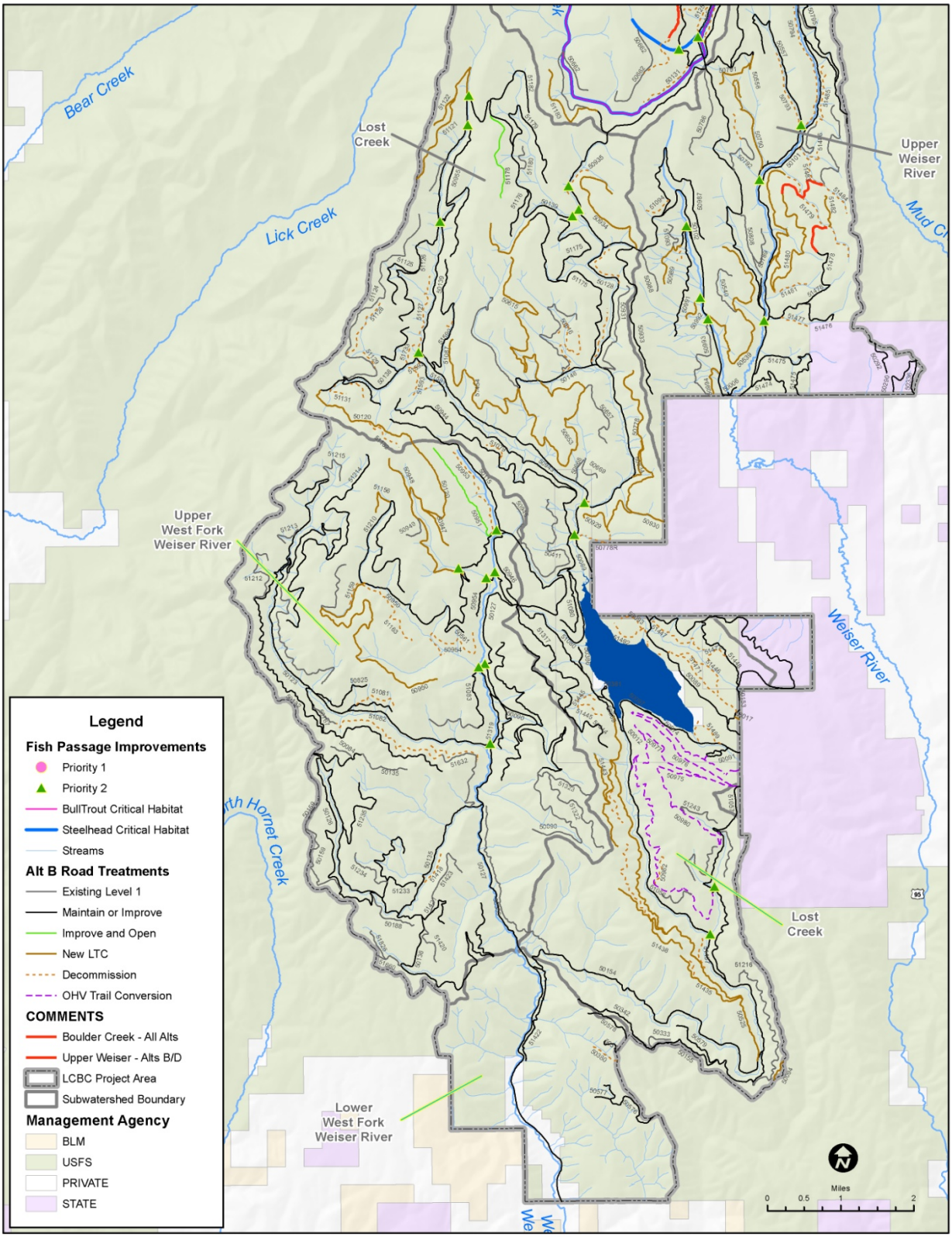


Figure 2-4. Alternative B Watershed Restoration Treatments, South

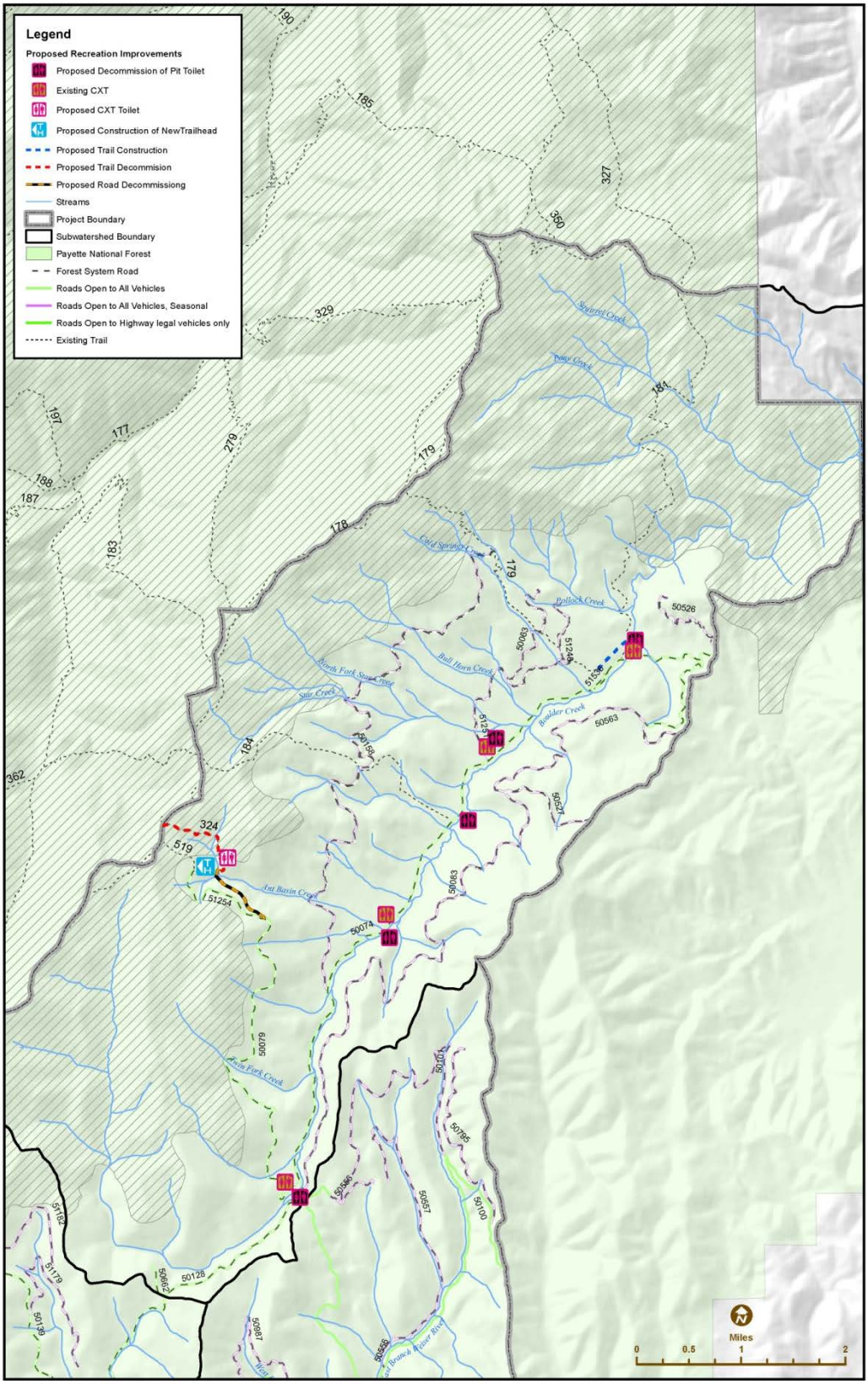


Figure 2-5. Alternative B Boulder Creek Recreation Improvements

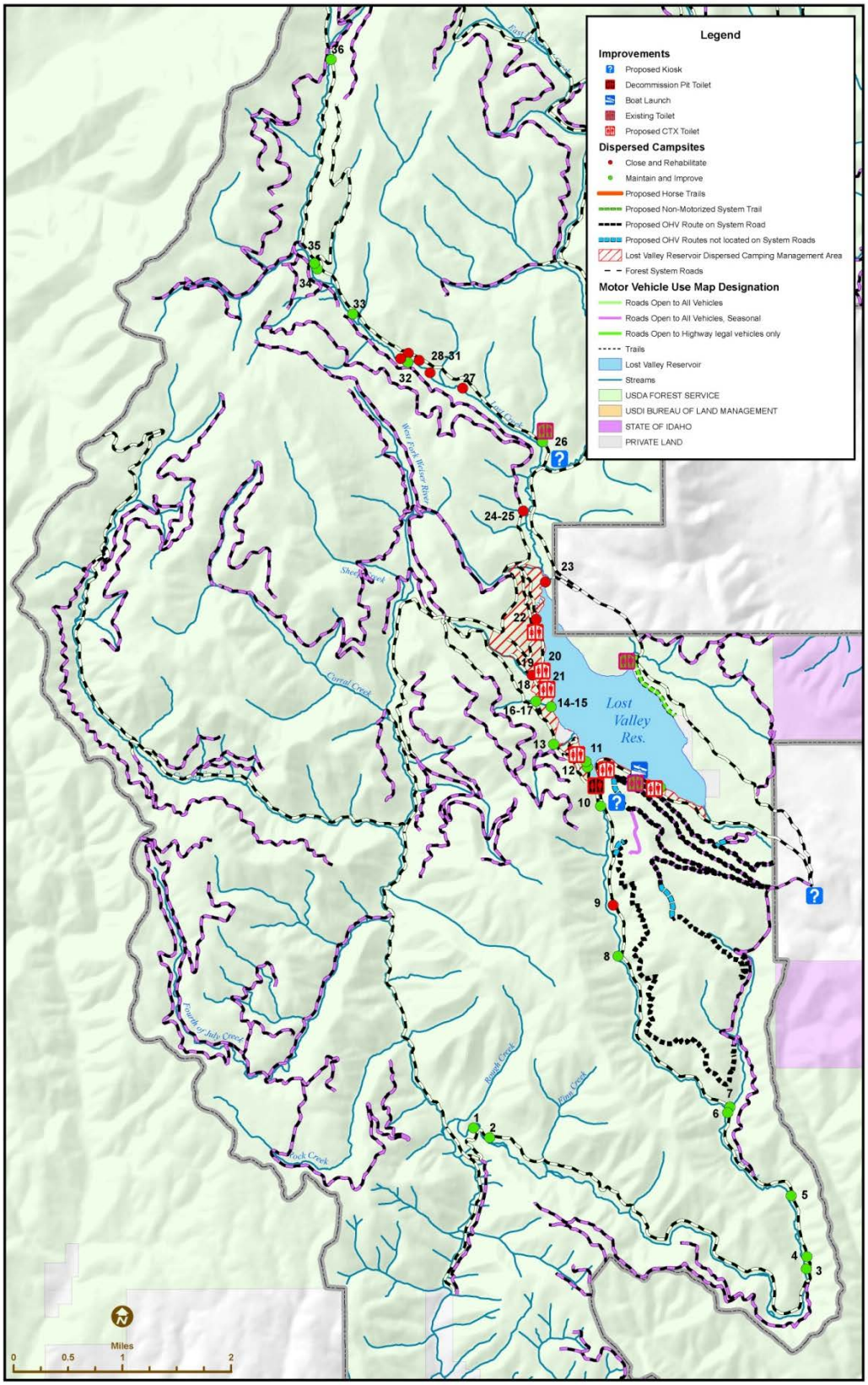


Figure 2-6. Alternative B Lost Creek Recreation Improvements

2.6 Alternative C

2.6.1 Alternative C Vegetation Treatments

This alternative proposes less intensive vegetative treatments and fewer acres of vegetative treatments than Alternative B. Approximately 14,500 acres of commercial treatments and approximately 22,000 acres of non-commercial treatments are proposed in Alternative C (see Figure 2-7). It has been designed to address concerns regarding soil, water, riparian and aquatic resources as well as wildlife concerns.

The primary differences between this alternative and Alternative B are that no regeneration treatments (patch cuts or shelterwood) would occur and no thinning in RCAs would occur. In addition, fewer acres of treatment within grand fir forest types are proposed and these treatments would generally be less intensive (i.e. remove less trees in treated areas) than those proposed in Alternative B.

Commercial Treatments

Commercial vegetative treatments would include: Commercial Thin-Free Thin (8,500 acres) and Commercial Thin-Mature Plantations (6,000 acres).

Stands would be thinned through commercial logging. Where appropriate and needed, sapling sized trees would be cut to reduce ladder fuels and promote desired advanced regeneration where necessary. Following harvest, these stands could be underburned as described in the prescribed fire section below.

Commercial thin-free thin (CT-FT) – 8,500 acres. Treatments in drier ponderosa pine and Douglas-fir forest types (PVGs 1 and 2) would be identical to those proposed in Alternative B. The purpose of CT-FT treatments would be identical to those in Alternative B.

In the cooler and moister grand fir forest types (PVGs 5 and 6), only the more dense stands (typically with higher existing canopy cover) would be proposed for treatment and only when there is an existing component of the desired species composition.

These treatments would be similar to CT-FT treatments described in Alternative B. The major differences are that this Alternative would:

- Limit the amount of sanitation cutting to improve stand health by reducing the anticipated spread of insects or disease. Sanitation treatments would not occur in mature stands unless they were in or adjacent to stands of young trees that would be adversely affected by forgoing sanitation treatments.
- These treatments would generally be completed in forested areas dominated by mature, vigorous ponderosa pine, Douglas-fir and / or western larch (*i.e.* - PVG 1, 2, 5 and portions of PVG 6 dominated by early seral species)
- In PVG 5 and 6, these treatments are proposed only in dense stands, typically with greater than 70 percent canopy cover.

Treatment specifications for Alternative C are identical to Alternative B except that:

- Trees infected with mistletoe would not be removed unless they met the criteria described above.

- Small openings would not be permitted unless it is to promote aspen regeneration in or adjacent to existing aspen.

Following treatment, these stands would be a mosaic of thinned areas, clumps of trees, and natural openings. The average canopy closure in these stands after harvest and underburn operations would be between 25 and 30 percent (10 to 20 foot crown spacing) in PVGs 1 and 2 and between 35and 50 (4 to 12 foot crown spacing) percent in PVGs 5 and 6. Portions of stands with natural openings and heavily thinned areas would have less canopy closure, perhaps as low as 15-20 percent. NIDGS treatment areas may reduce canopy closure to 15-30 percent canopy closure.

Commercial Thin / Mature Plantations (CT-MP) – 6,000 acres. These treatments would be identical to Alternative B except that 10-20 percent of each stand would be untreated to provide addition elk security and thermal cover.

Commercial Thin within RCAs-No commercial thinning treatments (CT-FT or CT-MP) within RCAs have been proposed in this alternative.

Non-commercial Treatments

Non-Commercial Thinning – 22,000 acres. Approximately 1,600 acres of non-commercial thinning in plantations as in Alternative B is proposed. Approximately 4,000 more acres of ladder fuel thinning have been proposed in Alternative C than in Alternative B.

Associated Actions

Actions associated with this alternative also include road maintenance and haul, temporary roads, harvest systems, and brush disposal. No site preparation or reforestation activities are planned as a part of this alternative. Other differences include:

- Fewer miles of system roads would be utilized for commercial product haul,
- 11 miles of planned temporary roads (six miles of which are on existing roadbeds) would be utilized.

2.6.2 Alternative C Prescribed Fire Treatments

Prescribed fire treatments under Alternative C would be identical to the proposed action (see Figure 2-2) with the exception that:

- No additional acres of prescribed fire would occur under Alternative C due to limitations related to environmental conditions and other projects involving the application of fire.

2.6.3 Alternative C Watershed Improvement and Restoration Treatments

Alternative C addresses comments that requested a more effective watershed restoration effort (especially in Boulder Creek) and is designed move the Boulder Creek subwatershed toward WCF Condition Class 1 and Forest Plan WCI category FA (Functioning Appropriately) for road density. This alternative emphasizes watershed restoration treatments in all subwatersheds throughout the project area (see Figures 2-8 and 2-9).

Vegetation Treatments

Vegetation treatments would not occur within RCAs anywhere in the project area under Alternative C. Vegetation management objectives would be achieved exclusively with prescribed fire.

Prescriptions for vegetation treatments would limit crown cover removal in drainages where ECA would increase over 25 percent, or where the Channel Condition Risk is moved into the High category.

System Road Treatments

Alternative C identifies additional system roads for decommissioning when compared to the proposed action (Table 2-2). All system road decommissioning proposed in this alternative would initiate ecological recovery and fully recontour (obliterate) the road prism by re-establishing hydrologic connectivity, providing sufficient ground cover, and encouraging native vegetation and to restore long-term soil productivity. Approximately 60 miles of system road and approximately 15 miles of unauthorized routes (described below) in the Boulder Creek subwatershed would be decommissioned, which would move the Road Density/Location WCI from the Functioning at Unacceptable Risk (FUR) category to the functioning at risk (FR) rating as described in Appendix B of the Forest Plan. The overall road density including system and unauthorized routes in the Boulder Creek subwatershed would be approximately 1.1 miles per square mile. This would also achieve the goal of improving the subwatershed toward the WCF "Class 1" condition class as described by Potyondy and Geier (2010). The change in condition class would be attributed to road decommissioning, (initiating improvements in long-term soil productivity), road and trail maintenance (reducing erosion), enhancement of aquatic habitat (increased fish passage), and improvements to RCAs (due to obliteration of roads within RCAs).

Miles of proposed system road decommissioning in the subwatersheds outside of Boulder Creek based on watershed restoration recommendations identified in the D3 Coalition Travel Analysis Plan. System road decommissioning and unauthorized route restoration treatments would move each subwatershed further toward desired conditions when compared to the proposed action. However, the Road Density/Location WCI would not differ from the proposed action in the Upper Weiser River, Lost Creek and Upper West Fork Weiser River subwatersheds. Road decommissioning proposed in this alternative would move the Road Density/Location WCI from FR to FA in the on-Forest portion of the Lower West Fork Weiser River subwatershed and would also change the WCF condition class of that subwatershed from "Class 2" to "Class 1" (Table 2-2).

Unauthorized Route Treatments

Unauthorized route restoration treatments proposed in each of the subwatersheds in the project area are displayed in Table 2-2. Alternative C includes more miles of unauthorized road restoration treatments than the proposed action. Approximately 15 miles of unauthorized routes in the Boulder Creek subwatershed are proposed to receive restoration treatments. All restoration treatments on unauthorized routes would be consistent with the description of treatments in the proposed action. Specific treatments on each route may vary, but all actions would attempt to initiate ecological recovery of the road prism to regain hydrologic connectivity, sufficient ground cover to reduce surface erosion, native vegetation and long-term soil productivity. Exceptions may occur where the route is not accessible or natural revegetation is considered adequate in achieving the ecological restoration goals (identical to the proposed action). Access would also be deterred where illegal motorized use has been or is currently occurring.

Road relocation and re-routes

The two road relocations proposed in the proposed action (FS 51478 and FS 51479 in the Upper Weiser River subwatershed), which would require construction of a new roadbed, would not occur in Alternative C. Three other road re-routes are proposed in this alternative that use existing system roads or existing roadbeds.

One road re-route in the Boulder Creek subwatershed would connect FS 51255 to FS 50079 by re-constructing an existing unauthorized route. This re-route would allow decommissioning of FS 50662 and allow for road access to the area for vegetation management.

The other road relocations would re-locate two segments of FS 50127 along the West Fork of the Weiser River from near the Forest boundary upstream to approximately the confluence of 4th of July Creek. FS 50127 would be relocated upslope to the existing (closed) FS 50580 and the existing (seasonal) FS 51422. This would remove (fully obliterate) FS 50127 from the RCA along the West Fork of the Weiser River, where the fill slope is eroding into the stream and trees have been removed along the right of way that provide shade to this water body with a TMDL for temperature.

Table 2-2. Alternative C Proposed Road Treatments by Subwatershed

Subwatershed	Existing System Road Miles/ Mapped Unauthorized Routes	System Road Decommissioning	Move to Long Term Closure (currently closed to the public)	Fish Passage Improvements	ATV Trail Conversion (currently Seasonally open road)	Restoration of Unauthorized Routes	Miles of Relocation and Re-route	Change to Motorized Access
Boulder Creek	93/22	60	2	16	0	15	Relocation 0 Re-route 0.6	-9.9
Lost Creek	183/73	26	35	11	12	51	Relocation 0 Re-route 0.1	-3.0
Lower West Fork Weiser	7/<1	3	0	0	0	1	Relocation 0 Re-route 2.0	-2.6
Upper West Fork Weiser	115/32	24	10	7	0	22	Relocation 0 Re-route 2.1	-11.4
Upper Weiser River	75/40	19	13	6	0	28	Relocation 0 Re-route 0	-2.6
Total	473/167	132	60	40	12	117	Relocation 0 Re-route 5.0	-29.8

Road Maintenance and Travel Management

System roads identified to remain on the landscape as part of the reduced MRS would be maintained and improved as described in the proposed action. Activities designed to reduce sediment production in the Boulder Creek subwatershed would be guided by site-specific (GRAIP) sediment modeling. All closed maintenance level 1 roads would receive appropriate long-term closure treatments including culvert removal, installation of drainage features, and establishment of vegetation to reduce erosion. All roads identified as closed to the public would receive an effective closure, such as gates or berms, or by obliteration of a short section or road and placement of rock or large woody debris.

Fish Passage/Habitat Connectivity

Within the Boulder Creek subwatershed, the 16 crossings identified as important fish passage barriers in streams occupied by ESA listed fishes or in DCH and their priority rating (Priority 1 or Priority 2), would

remain the same as in the proposed action. Twelve of those crossings would be addressed by removal as part of proposed road decommissioning. The four remaining crossings (which are located on steelhead DCH) would be replaced with appropriate crossing structures.

In addition to the aforementioned 16 crossings in the Boulder Creek subwatershed, an additional seven (mapped) perennial stream crossings would be removed during decommissioning on the northern portion of the Chokecherry Flat Road (FS50158) which would provide additional improvements in fish habitat connectivity in streams including: Pollock Creek, Cold Springs Creek, Bull Horn Creek, Star Creek and the North Fork of Star Creek. Additional stream crossing removals would also occur on unnamed and unmapped streams, but the exact number is not known.

Outside of the Boulder Creek watershed, actions regarding fish passage improvements would be identical to those described in the proposed action. Additional stream crossings would be removed through road decommissioning (when compared to the proposed action) but improvements to fish passage from those crossing removals is expected to be incremental.

2.6.4 Alternative C Recreation Improvements

The recreation portion of Alternative C would be the same as Alternative B with the following exceptions (see Figure 2-11):

The proposed OHV trail miles in the Lost Creek area are reduced to 11miles, with reductions made to eliminate steep sections of routes not suitable for a sustainable trail. No additional routes would be identified between draft and final, so OHV trails would remain at 11 miles. OHV trails would be limited to "vehicles 50 inches and less in width (more typical of current ATV trails). Trails would be designed to meet Trail Class 2 standards for All-terrain vehicles as defined in FSH 2309.18 – Trails Management Handbook. These trails have a standard width of 48 – 60 inches, are on native material with limited grading, with structures minimum width being 60 inches.

In the Lost Creek area, approximately 20 miles of non-motorized, Trail Class 1 (minimally developed) (FSH 2353.142, Exhibit 01) with a managed and designed use for Pack and Saddle Stock use would be added to the trail system. These new trails would be also open to other non-motorized uses, including hiking and mountain biking. The added trails are primarily located on existing road prism. Approximately 3 miles of trail would need to be constructed to connect these proposed loops.

Lick Creek Trail #358, which accesses the Lick Creek Lookout, would receive heavy trail maintenance.

Dispersed camping using a motorized vehicle would be restricted to designated sites only on open roads throughout the project area. Approximately 200 sites could be designated (including the 68 sites proposed for designation surrounding the Lost Valley Reservoir road system.

Public Access

Open roads available for public access drops 41 miles from the existing condition to 224 miles of open road available for public access and recreation opportunities including, but not limited to hunting access, fire wood gathering, berry picking, scenic driving, and dispersed camping in designated sites along the open roads.

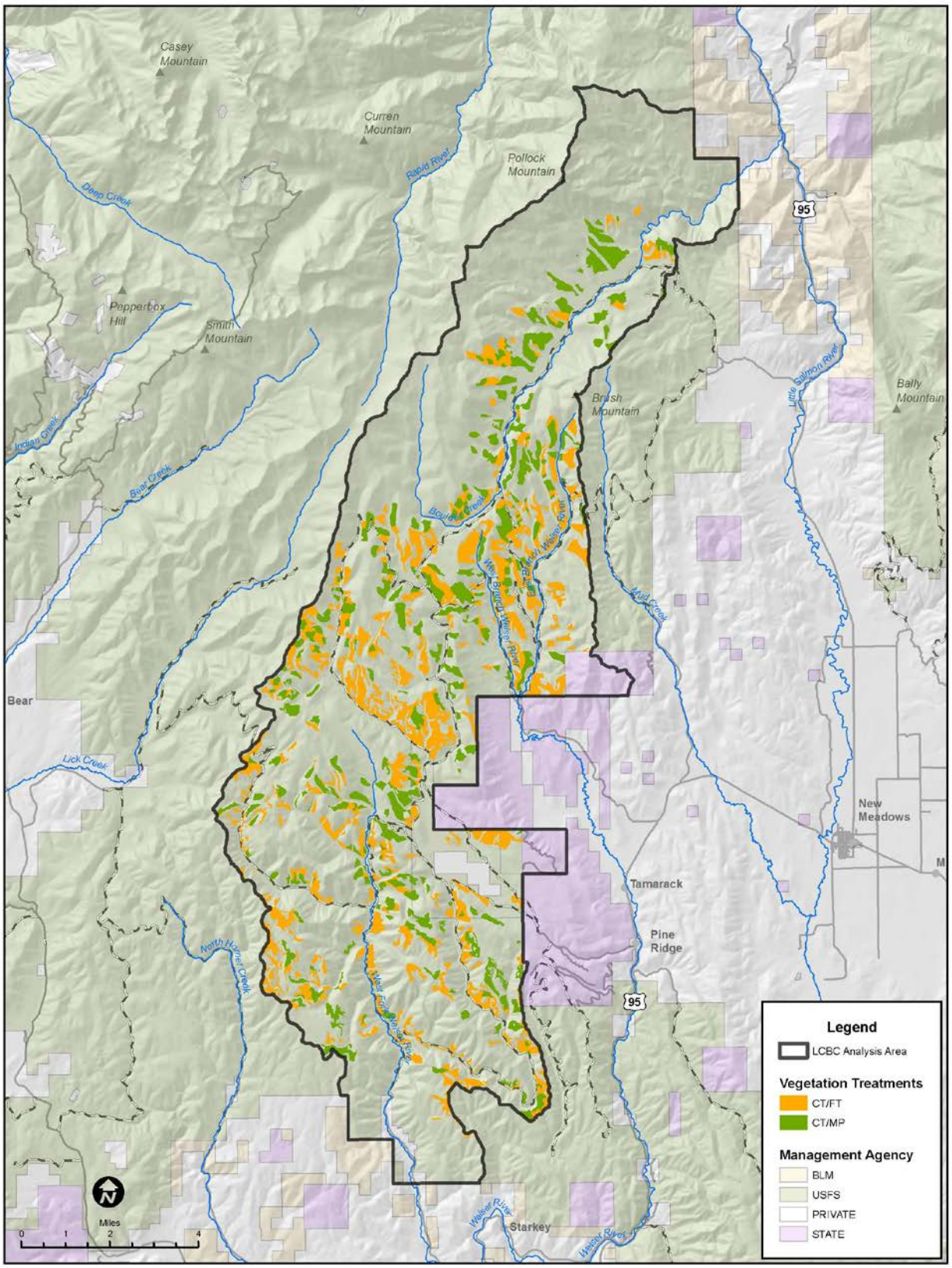


Figure 2-7. Alternative C Vegetation Treatments

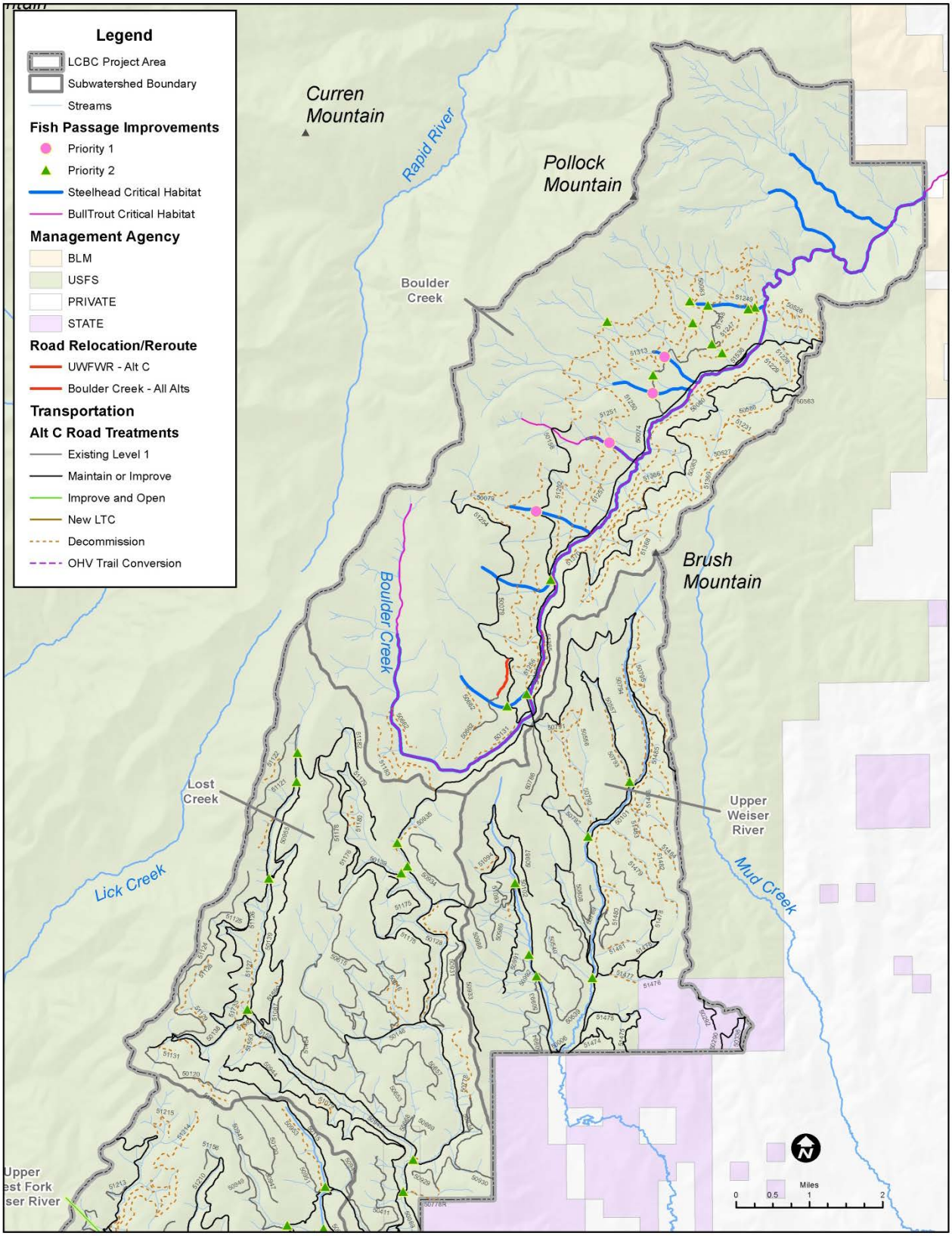


Figure 2-8. Alternative C Watershed Restoration Treatments, North

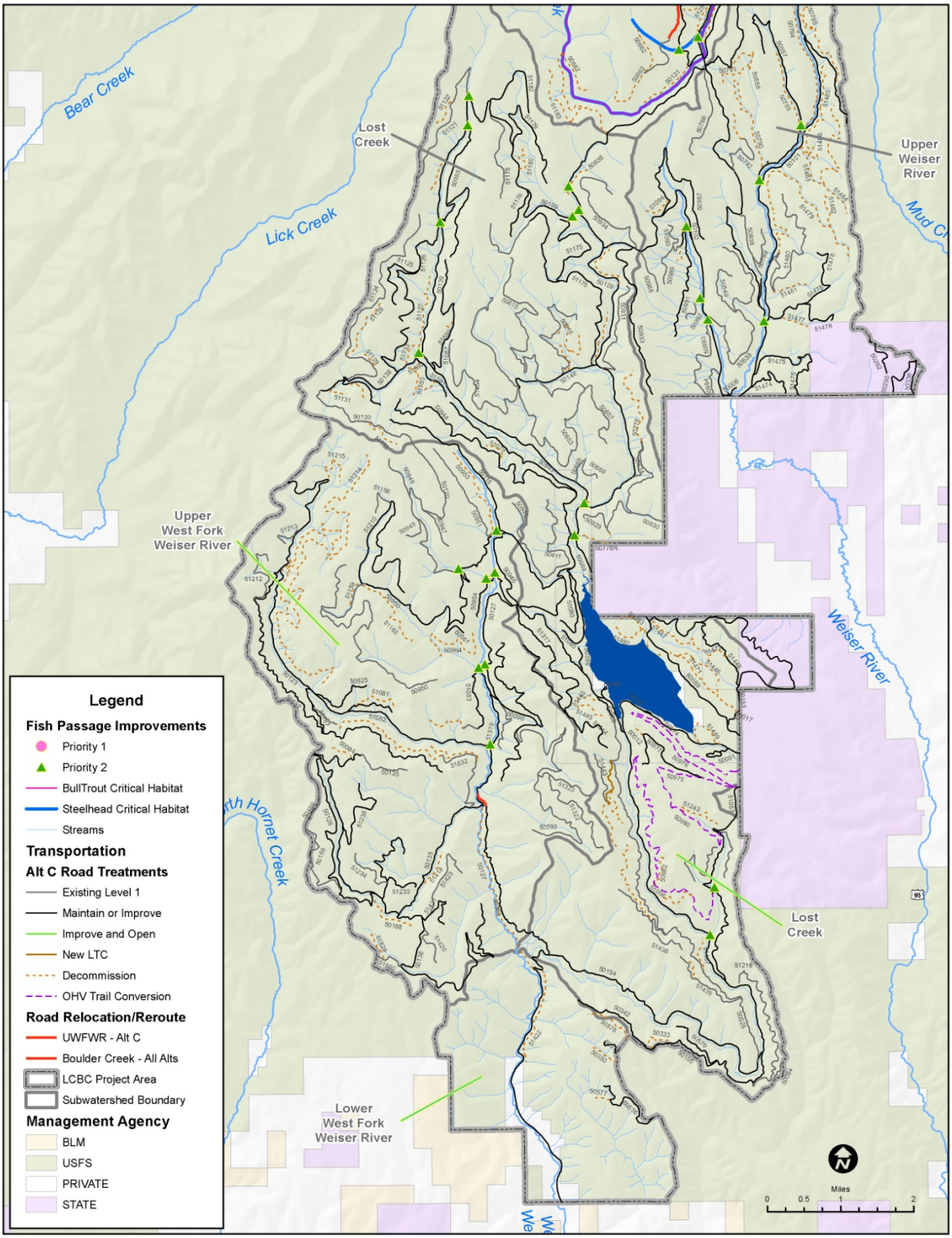


Figure 2-9. Alternative C Watershed Restoration Treatments, South

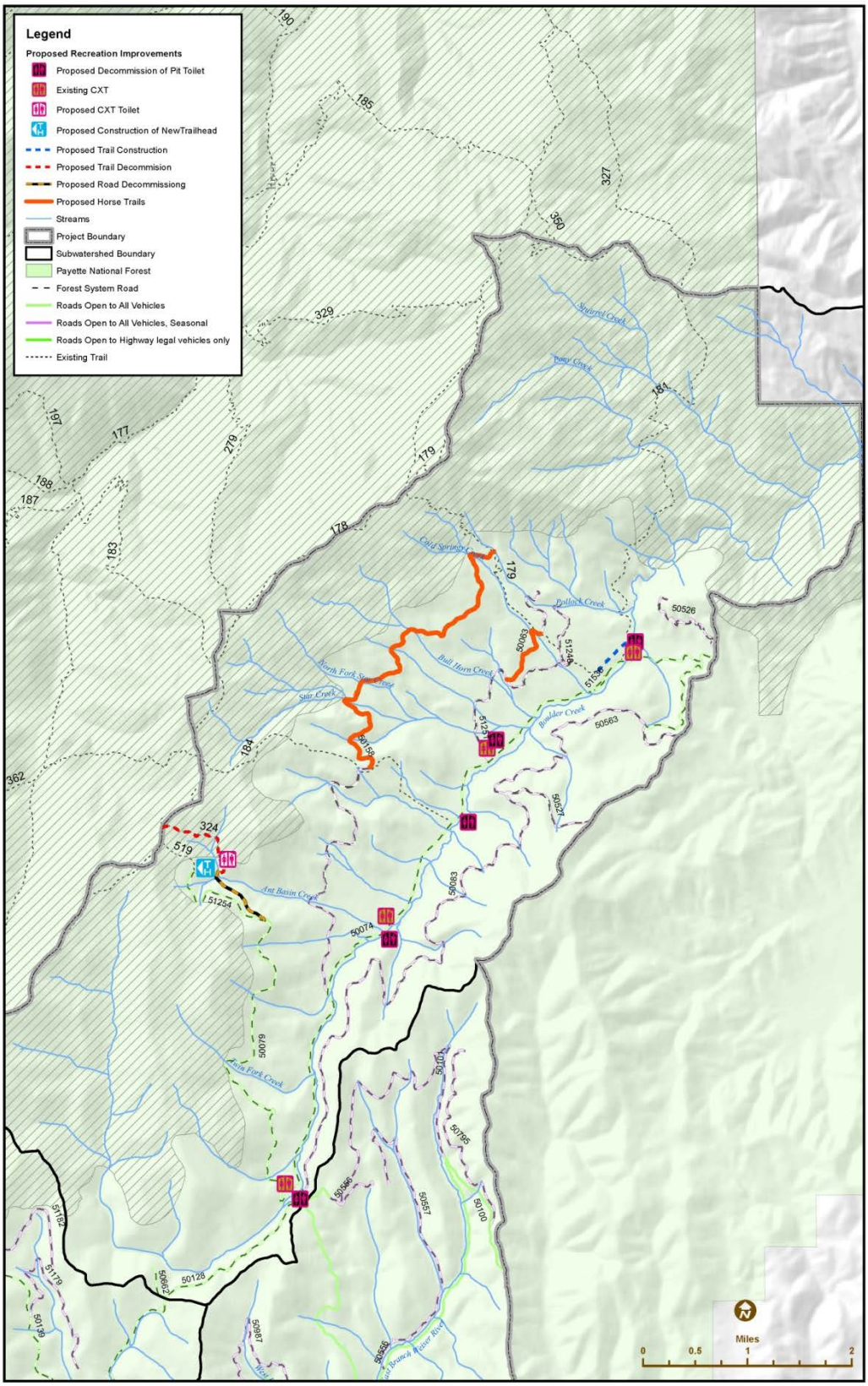


Figure 2-10. Alternative C Boulder Creek Recreation Improvements

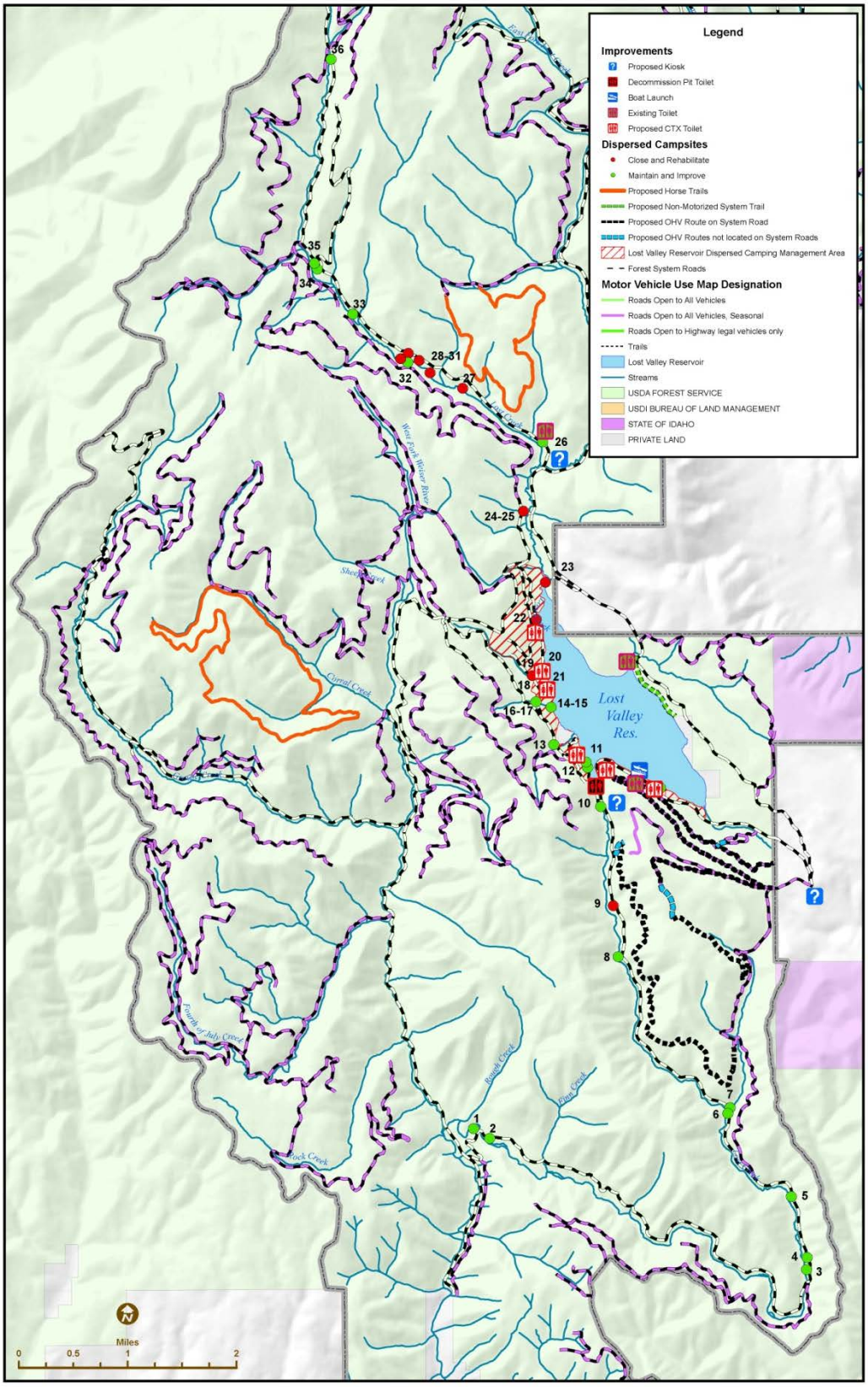


Figure 2-11. Alternative C Lost Creek Recreation Improvements

2.7 Alternative D

Alternative D responds to comments relating to the intensity and benefit of treatments (species composition, level of vegetation restoration, and spatial arrangement of forested vegetation).

2.7.1 Alternative D Vegetation Treatments

This alternative proposes the greatest amount and the most intensive vegetative treatments of all the alternatives (approximately 25,000 acres of commercial treatments and approximately 18,000 acres of non-commercial treatments). It has been designed to address concerns regarding the level of vegetative restoration and duration of benefits (see Figure 2-12).

The primary differences between Alternative D and the proposed action are additional vegetative treatments have been proposed and the regeneration treatments are more intensive.

Commercial Treatments

Commercial vegetative treatments would include: Commercial Thin-Free Thin (14,500 acres), Shelterwood with Reserves (2,600 acres), and Commercial Thin-Mature Plantations (8,100).

Commercial thin-free thin (CT-FT) – 14,500 acres. The purpose and description of these treatments would be similar to Alternative B except that:

The specifications for this treatment include:

- Where aspen are present, conifers could be removed within the aspen stand to improve the integrity of these stands. Openings of less than 10 acres may be utilized to stimulate aspen regeneration.
- In PVGs 1 and 2, the average canopy cover in these stands after harvest and underburn operations would be between 20 and 30 percent (10 to 25 foot crown spacing). In PVGs 5 and 6, average post treatment canopy cover would be between 30 and 35 percent (10 to 15 foot crown spacing).

The average canopy cover in these stands after harvest and underburn operations would be between 20 and 35 percent.

Shelterwood with Reserves – 2,600 acres. This alternative would utilize the shelterwood with reserves with reserves method to regenerate stands that do not have enough ponderosa pine, western larch and/or Douglas-fir to free thin throughout and retain these species in desired quantities.

These treatments would retain small clumps and patches of untreated areas throughout each stand to meet wildlife and visual quality objectives. The specifications for this treatment are:

- In regenerated portions of the stand retain a minimum of 8-12 trees per acre (approximately 10-12 percent canopy cover), preferably seral species in the dominant and codominant crown classes. If seral species are not available, dominant nonseral and vigorous serals in any crown class would be the second preference for reserve trees;
- Retain 5 to 10 percent of the stand area in untreated patches ranging from 1/10th to two acres in size. These patches should be located where there are clumps of seral species and/or around existing snags (preferably seral snag greater than 20 inches in diameter), when available;

- If portions of the stand could be treated with CT-FT treatment and retain a basal area of greater than 40 feet^2 of seral species, treat those areas with CT-FT treatment described above.

Commercial Thin / Mature Plantations (CT-MP) - 8,100 acres. These treatments would be identical to Alternative B.

Commercial Thin within RCAs-Commercial treatments within RCAs would be identical to Alternative B except an additional 200 acres of RCAs have been proposed for treatment bringing the total to 2,000 acres of CT-FT and CT-MP treatments in RCAs. Again, these treatments are not in addition to the CT-FT and CT-MP acres proposed above but are included in the totals for those treatments.

Non-commercial Treatments

Non-Commercial Thinning – 18,000 acres. Same as Alternative B.

Associated Actions

Actions associated with this alternative (road maintenance, temporary roads, harvest systems, and brush disposal) are identical to Alternative B except that additional site preparation and reforestation would be completed and 31 miles of planned temporary roads are proposed. Incidental temporary roads would be identical to Alternative B.

2.7.2 Alternative D Prescribed Fire Treatments

Prescribed fire actions under Alternative D would be the same as under Alternative B, the proposed action (see Figure 2-2). Additional acres of prescribed fire may be completed in areas thinned but not targeted for burning for brush disposal and site preparation objectives under this alternative.

2.7.3 Alternative D Watershed Improvement and Restoration Treatments

All project activities designed for watershed improvement (road treatments and fish passage improvements) would remain as described in the proposed action (Alternative B), with the exception that under Alternative D 12 miles of road would be changed to long-term closure (see Figures 2-13 and 2-14).

2.7.4 Alternative D Recreation Improvements

Recreation improvements under Alternative D would be the same as under Alternative B, the proposed action (see Figures 2-5 and 2-6).

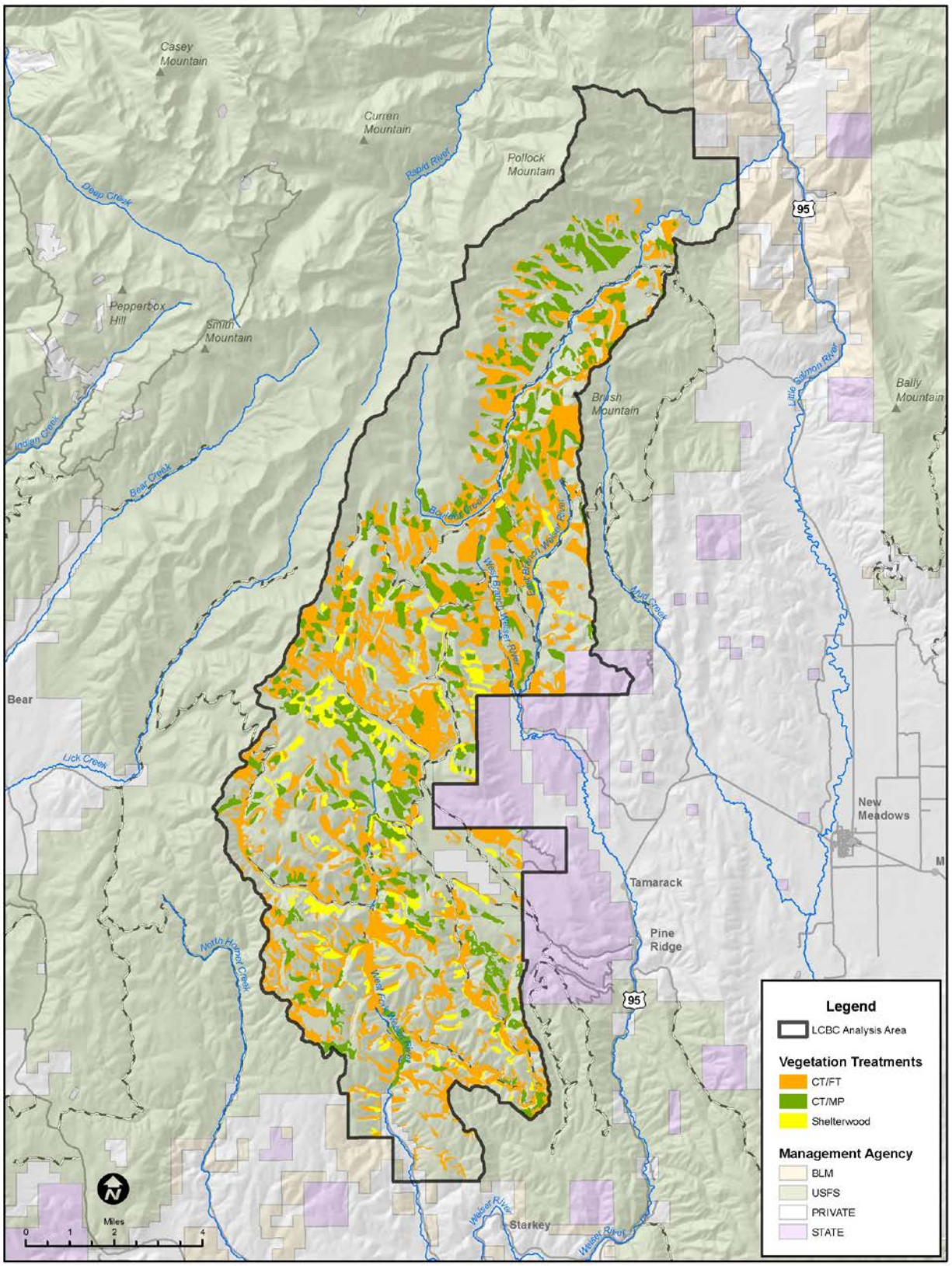


Figure 2-12. Alternative D Vegetation Treatments

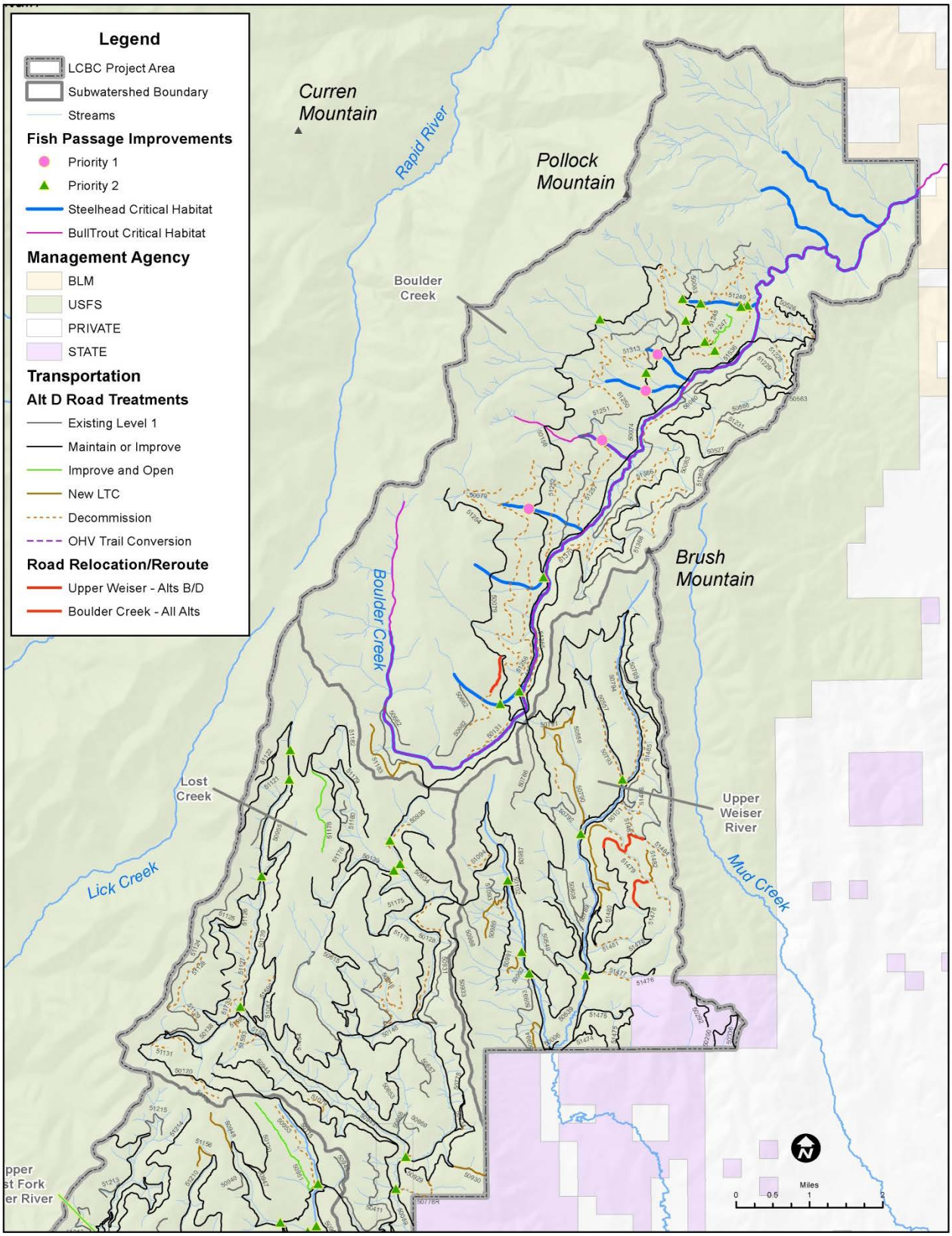


Figure 2-13. Alternative D Watershed Restoration Treatments, North

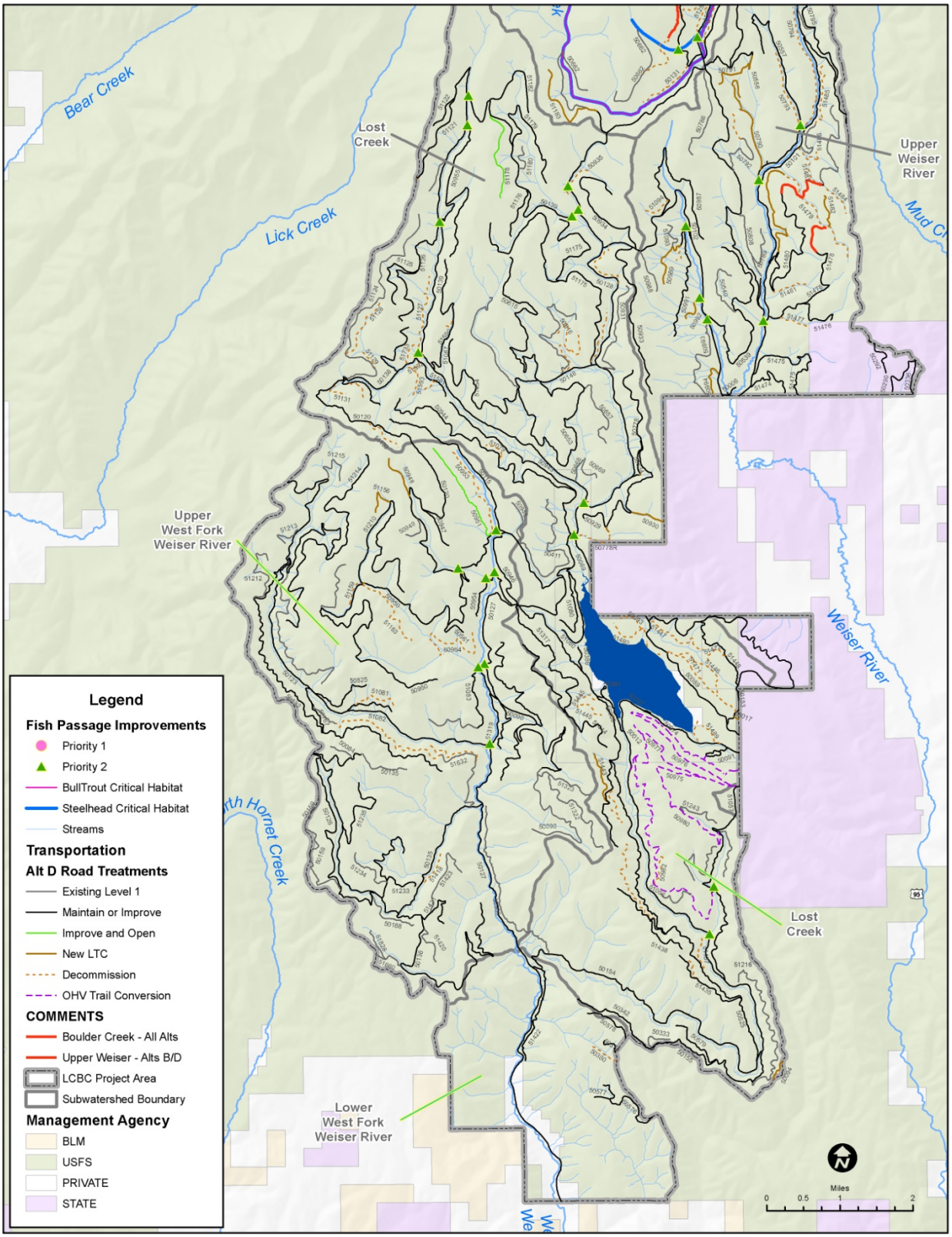


Figure 2-14. Alternative D Watershed Restoration Treatments, South

2.8 Alternative E.

Alternative E responds to comments that question the implementation costs of the project compared to projected economic and restoration benefits. It drops some of the more expensive treatments, while attempting to retain restoration goals of the proposed action.

2.8.1 Alternative E Vegetation Treatments

Similar treatments to Alternative D are proposed in Alternative E, although less acres of treatment have been proposed. Approximately 20,500 acres if commercial treatments and approximately 12,000 acres of non-commercial treatments are proposed in Alternative E (see Figure 2-15). Treatments are spatially arranged to create continuous blocks of habitat. In addition, some of the more expensive treatments have been limited in amount to create an alternative that is more cost conscientious than the other alternatives.

Commercial Treatments

Fewer commercial acres have been proposed because treatments have been designed to retain areas with elk security, to clump treatments and to minimize restoration treatments in mature plantations that are isolated from other commercial treatments.

Commercial thin-free thin (CT-FT) – 13,200 acres. This would be identical to Alternative D, except that fewer acres are proposed.

Shelterwood with Reserves – 1,900 acres. This treatment would be identical to the Shelterwood with Reserves treatment in Alternative D. Slightly fewer acres have been proposed to focus regeneration treatments adjacent to high priority CT-FT treatments.

Commercial Thin / Mature Plantations (CT-MP) – 5,400 acres. This alternative would treat fewer acres of mature plantations than any of the other alternatives in an attempt to minimize cost while prioritizing mature plantations that would best benefit from this treatment.

The description of this treatment in Alternative B would apply.

Commercial Thin within RCAs-Commercial treatments within RCAs would be identical to Alternative B except 200 acres less of RCAs have been proposed for treatment, bringing the total to 1,600 acres of CT-FT and CT-MP treatments in RCAs. Again, these treatments are not in addition to the CT-FT and CT-MP acres proposed above but are included in the totals for those treatments.

Non-commercial Treatments

Non-Commercial Thinning –12,000 acres. Under Alternative E approximately 900 acres of plantation-specific thinning and 11,100 acres of ladder fuel thinning would occur. This is 30 percent less ladder fuel thinning than under Alternative B, the least amount of non-commercial thinning of all action alternatives.

Associated Actions

Associated actions in this alternative would be identical to Alternative D except that only 15 miles of planned temporary roads are proposed; and brush disposal would emphasize machine piling and burning, whole tree yarding and landing pile burning. Biomass removal would still be utilized but would only occur when necessary to meet other resource objectives (*i.e.* – visual quality, wildlife, SWRA).

2.8.2 Alternative E Prescribed Fire Treatments

Prescribed fire treatments under Alternative E would be identical to the proposed action with the following exceptions (see Figure 2-16):

- Total acres of total prescribed fire would be decreased by 30 percent (31,500 acres)
- Acres of prescribed fire applied annually would be decreased by 30 percent (500-7,000 acres)
- No prescribed fire treatments would be applied within the Boulder Creek Watershed

2.8.3 Alternative E Watershed Improvement and Restoration Treatments

System Road Treatments and Road Density

Alternative E identifies fewer system roads for decommissioning (obliteration) when compared to the proposed action. All system road decommissioning proposed in this alternative would fully recontour (obliterate) the road prism, unless not practicable (identical to the proposed action) (see Figures 2-17 and 2-18). System road decommissioning and resulting road density would remain the same as the proposed action in the Boulder Creek subwatershed as would the resulting watershed condition ratings.

In the remainder of the project area, the miles of system road decommissioning (obliteration) would be reduced by placing some of the roads identified for decommissioning in the proposed action into maintenance level 1 (long-term closure). If roads identified in the proposed action for decommissioning are currently maintenance level 1, they would be decommissioned (obliterated) as described in the proposed action (approximately 22 miles, excluding FS 51483 in the Upper Weiser River subwatershed, which would remain in maintenance level 1. If roads are currently maintenance level 2, and closed on the MVUM, they would be changed to maintenance level 1 and receive long-term closure treatments (including culvert removal, installation of drainage features, and establishment of vegetation to reduce erosion). An initial short section of road would be obliterated and rocks or large woody debris would be placed on the roadbed to provide an effective physical road closure.

Unauthorized Route Treatments.

Unauthorized route treatments would remain the same as the proposed action and are displayed in Table 2-3. All restoration treatments on unauthorized routes would be consistent with the description of treatments in the proposed action and would fully recontour (obliterate) the road prism unless not practicable. Exact treatments on each route may vary, but all actions would attempt to initiate ecological recovery of the road prism to regain hydrologic connectivity, sufficient ground cover, native vegetation and long-term soil productivity. Travel Plan closures would be enforced by deterring access where illegal motorized use has been occurring.

Road-relocations and Re-routes

The only re-route proposed in this alternative is in the Boulder Creek subwatershed which would connect FS 51255 to FS 50079 by re-constructing the existing unauthorized route 512552000. This re-route would allow access to the area without incurring the cost of building a connector for 50662. FS 51255 and FS 50662 would remain in long term closure after the sale is complete.

Table 2-3. Alternative E Road Treatments

Subwatershed	Existing System Road Miles/ Mapped Unauthorized Routes	System Road Decommissioning	Move to Long Term Closure (currently closed to the public)	Fish Passage Improvements	ATV Trail Conversion (currently Seasonally open road)	Restoration of Unauthorized Routes	Miles of Relocation/Re-Route	Change to Motorized Access
Boulder Creek	93/22	29	2	16	0	12	Relocation 0 Re-route 0.6	-1.0
Lost Creek	183/73	13	35	0	12	40	Relocation 0 Re-route 0	-1.4
Lower West Fork Weiser	7/<1	0	0	0	0	0	Relocation 0 Re-route 0	-.04
Upper West Fork Weiser	115/32	6	10	0	0	20	Relocation 0 Re-route 0	-.06
Upper Weiser River	75/40	3	13	0	0	18	Relocation 0 Re-route 0	-.05
Total	473/167	51	60	16	12	90	Relocation 0 Re-route 0.6	-3.9

Road Maintenance and Travel Management

Roads identified to remain on the landscape as part of the MRS would be maintained and improved as described in the proposed action. Activities designed to reduce sediment production in the Boulder Creek subwatershed would be guided by site-specific (GRAIP) sediment modeling. Closed maintenance level 2 roads identified to become maintenance level 1 roads would receive long-term closure treatments including culvert removal, drainage features, and establishment of vegetation to reduce erosion. All roads identified as closed to the public would receive effective closure.

Fish Passage/Habitat Connectivity

The 16 crossings identified in the Boulder Creek subwatershed would be improved (removed or replaced) as described in the proposed action. The 24 fish passage improvements in the Weiser River subbasin identified in the proposed action would not be addressed with this project.

2.8.4 Alternative E Recreation Improvements

Recreation improvements under Alternative E would be the same as under Alternative B, the proposed action (see Figures 2-5 and 2-6).

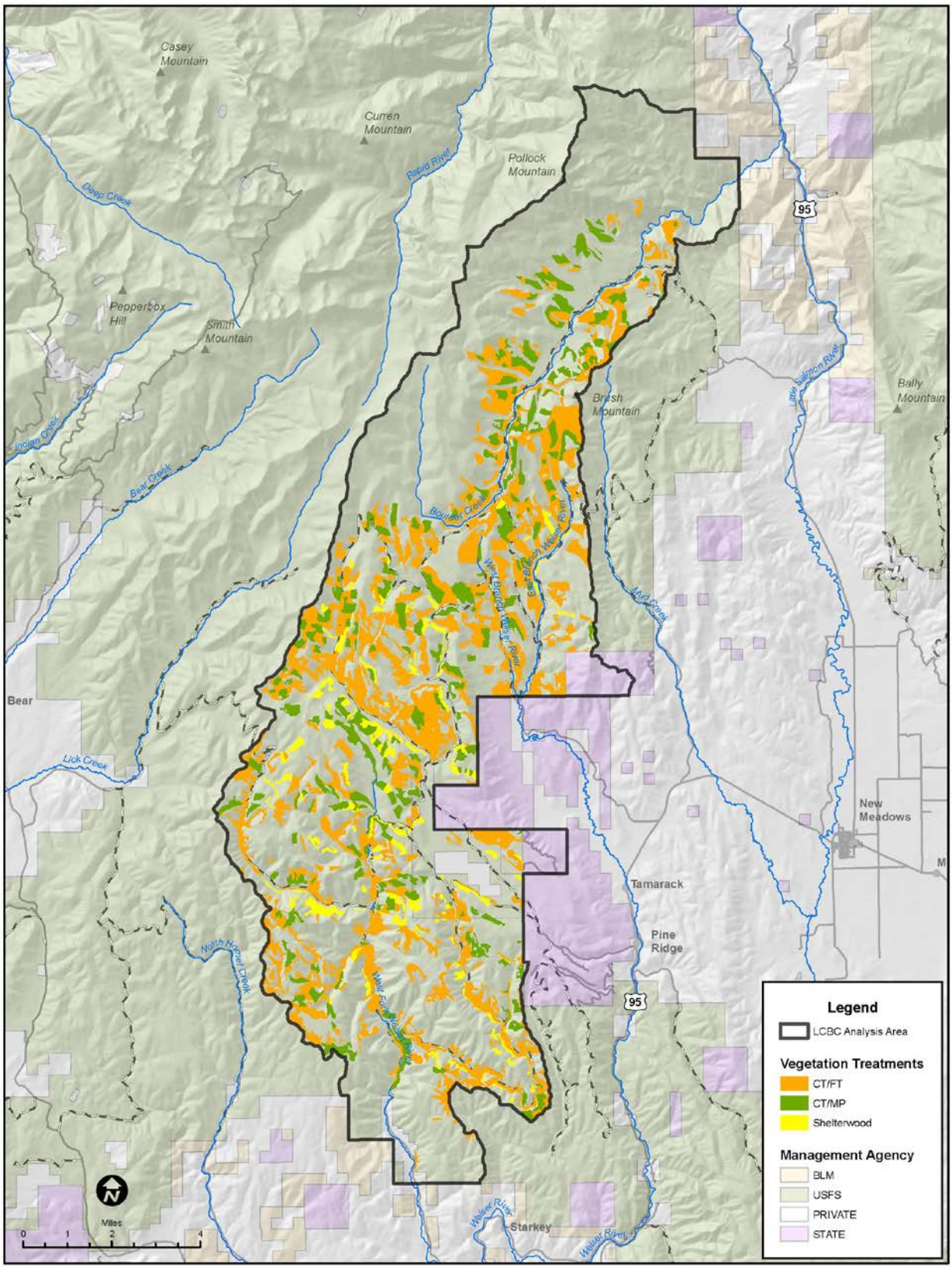


Figure 2-15. Alternative E Vegetation Treatments

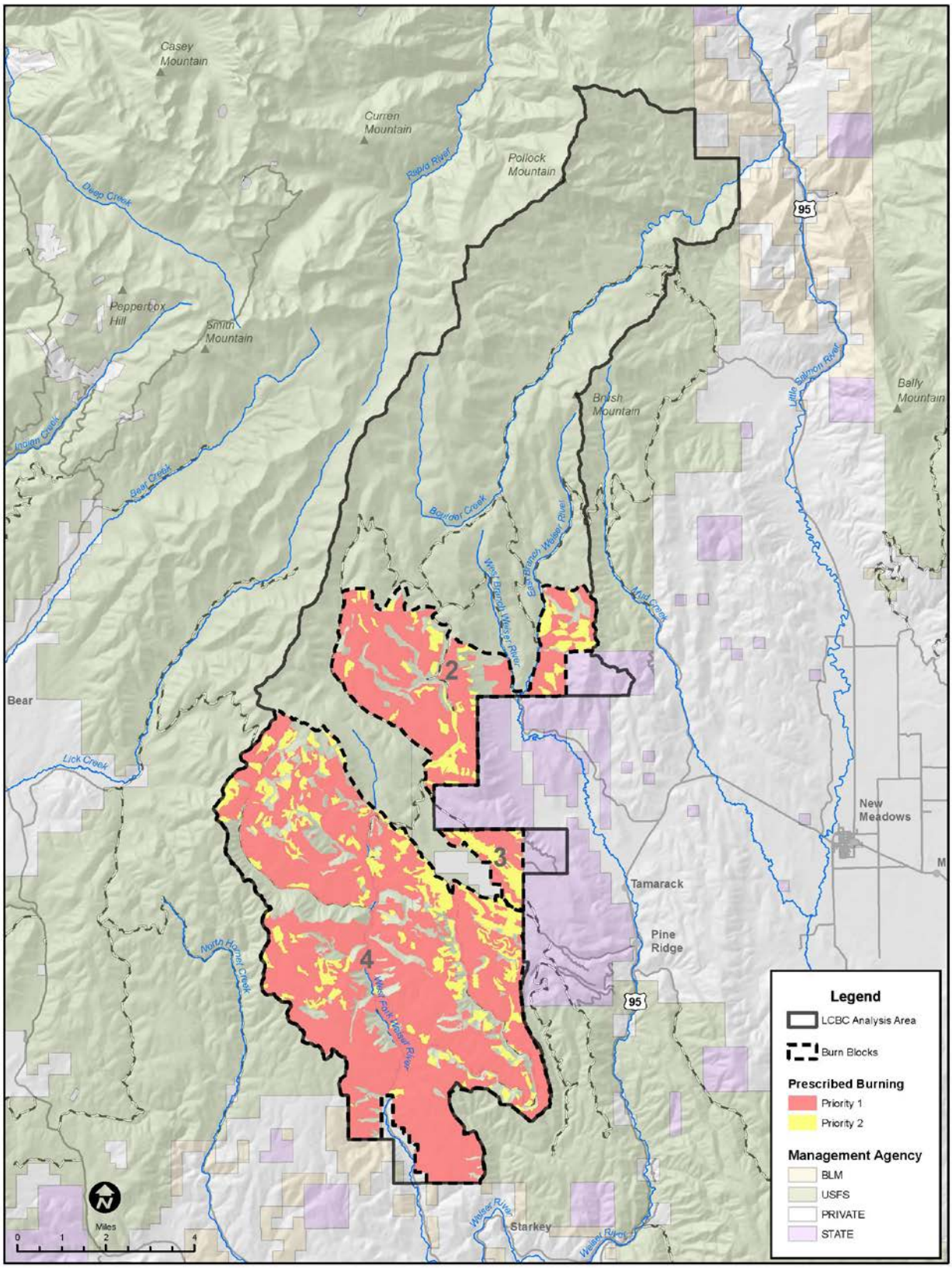


Figure 2-16. Alternative E Prescribed Fire Treatments

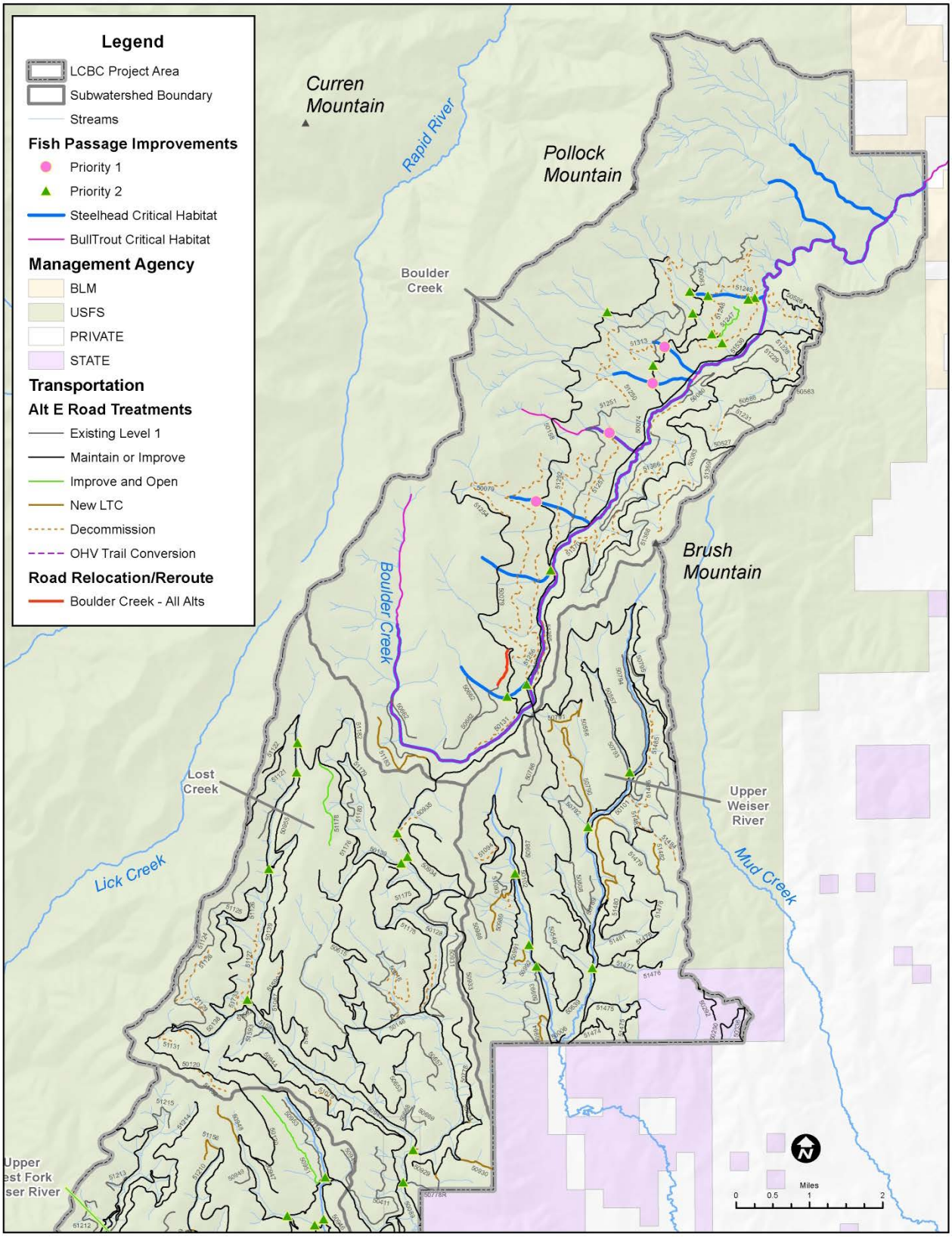


Figure 2-17. Alternative E Watershed North

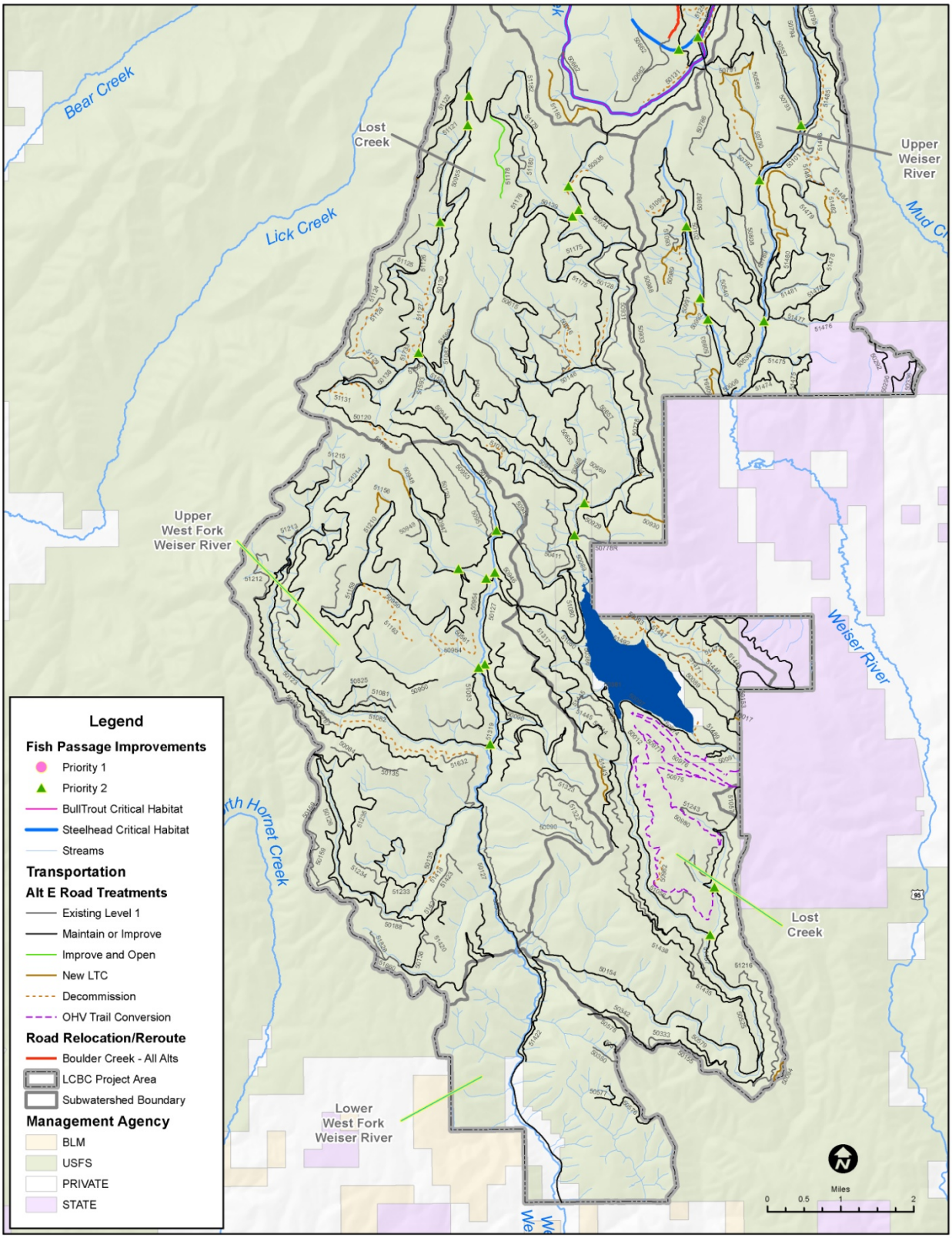


Figure 2-18. Alternative E Watershed South

2.9 Management Requirements

Management requirements are standards project activities must adhere to that are established to protect Forest resources; they may be implemented before, during or after a project to meet Forest Plan and other direction. The proposed action includes the management requirements and project design features listed in Tables 2-4 and 2-5. More management direction, including a complete list of standards and guidelines that apply to all action alternatives, can be found in the Forest Plan.

Table 2-4. Management Requirements

Management Requirements	Objective	Implementation Mechanism
Forested Vegetation		
The activity area shall be used to assess snag and coarse wood conditions for vegetation management actions *(Forest Plan p. III-30, VEST1).*	Retain CWD to maintain soil productivity, ecological function and other benefits	Silvicultural Prescription
Vegetation management actions associated with developed recreation shall be designed to meet recreation objectives, not vegetative desired conditions described in Appendix A. *(Forest Plan p. III-30, VEST2).*	Protect investments in developed recreation areas.	Silvicultural Prescription
Minimum stocking requirements for plantation certification shall meet those specified by PVG in the Forest Plan. *(Forest Plan p. III-42, TRST1).*	Ensure adequate stocking and consistency with the NFMA.	Silvicultural Prescription
Even aged regeneration treatments shall not exceed 40 acres and shall be separated by stands not defined as an opening. *(Forest Plan p. III-42, TRST2).*	Ensure consistency with NFMA.	Silvicultural Prescription
Openings created by timber harvest will no longer be considered an opening when a new forest stand is established as documented through certification exams. *(Forest Plan p. III-43, TRST3).*	Ensure consistency with NFMA.	Silvicultural Prescription
Wood products harvested within RCAs, from high risk landslide prone areas and/or PVG 1 shall not contribute to the Allowable Sale Quantity. *(Forest Plan p. III-43, TRST4 and 5).*	Ensure treatments on lands determined to be not suited for timber production are designed to meet other resource needs/concerns.	Silvicultural Prescription
No regeneration harvest within the Boulder Creek Watershed shall occur regardless of the MPC. *(Forest Plan p. III-150, TRST0457 and p. III-159, TRST0509).*	Ensure consistency with the Forest Plan regarding treatments.	Silvicultural Prescription
SWRA (Soil, Water, Riparian, and Aquatic Resources) - Forest-wide Management Direction		
Trees that are felled within RCAs must be left unless determined not to be necessary for achieving soil, water, riparian and aquatic desired conditions. Felled trees or snags left in RCAs shall be left intact unless resource protection or public safety requires bucking them into smaller pieces *(Forest Plan p. III-22, SWST10).*	Retain LWD in riparian areas to be available for sediment filtering, recruitment in streams, and for soil needs.	Contract specifications
Do not store fuel or other toxicants or perform refueling within RCAs. Exceptions must have authorization of fish biologist or hydrologist and have approved spill containment plan commensurate with the amount of fuel stored *(Forest Plan p. III-22, SWST11).*	Reduce potential for fuel spills that could affect fish or fish habitat.	Contract specifications

Management Requirements	Objective	Implementation Mechanism
Diversity and productivity of native and desired non-native plant communities in riparian conservation areas: a) Provide amounts and distribution of large woody debris consistent with desired forest vegetation conditions described in Forest Plan Appendix B; b) Provide adequate summer and winter thermal regulation within the aquatic and riparian zones; and *c)* Achieve rates of surface erosion, bank erosion and chemical migration characteristic of those under which the communities developed. *(Forest Plan p. III-19 SWGO15)*	Maintain LWD, stream shading for thermal regulation and maintain sediment levels.	Project design features
Management actions shall be designed in a manner that maintains or restores water quality to fully support beneficial uses and native and desired non-native fish species and their habitat (*Forest Plan p. III-21, SWST01).*	Design and implement management programs and plans that will restore water quality and watershed function to support beneficial uses.	Project design
Apply Best Management Practices (BMPs) as described in Soil and Water Conservation Practices, to all ground disturbing activities *(Forest Plan p. III-18, FSM 2530, FSH 2509.22, Soil and Water Conservation Practices Handbook).*	Reduce or minimize effects of management activities on soil and water resources.	Contract specifications, mitigation measures
Maintain detrimental disturbance levels at 15 percent or less within activity areas following completion of proposed activities *(Forest Plan p. III-21, SWST02, FSH 2509.18).*	Maintain the physical, chemical, and biological properties of soils to support desired vegetation conditions and soil-hydrologic functions and processes within watersheds.	Contract specifications, mitigation measures
Apply mitigation and restoration measures within the activity area so that total soil resource commitment (TSRC) levels are moved back toward 5 percent or less following completion of the activities *(Forest Plan p. III-21, SWST03).*	Limit the extent of soil committed to non-productive land uses, such as roads and landings, to the minimum necessary for Forest management. Maintain soil productivity and ecological processes where functioning properly, and restore where currently degraded.	Contract specifications, mitigation measures

Management Requirements	Objective	Implementation Mechanism
Neither degrade nor retard attainment of properly functioning soil, water, riparian, and aquatic desired conditions except where outweighed by demonstrable short or long-term benefits to watershed resource conditions or where the Forest Service has limited authority (such as access roads) (*Forest Plan p. III-22, SWST04, FSH 2520).*	Maintain surface and ground water in streams, lakes, wetlands, and meadows to support healthy riparian and aquatic habitats; stability and effective function of stream channels; and downstream uses. Restore and maintain flow regimes sufficient to create and sustain soil-hydrologic and water quality conditions; and riparian, aquatic and wetland habitat; and to achieve patterns of sediment, nutrient, and large woody debris routing within their inherent range of capability.	Project design, contract specifications, mitigation measures
Within legal authorities, ensure that new proposed management activities within watersheds containing 303(d) listed waters improve or maintain overall progress toward beneficial use attainment for pollutants that led to the listing *(Forest Plan p. III-22, SWST07).*	Manage water quality to meet requirements under the Clean Water Act, with special emphasis on de-listing water quality limited waters under section 303(d) and supporting stated development and implementation of TMDLs.	Project design, contract specifications, mitigation measures
Conduct site-specific analysis or field verification of landslide-prone models to identify areas of landslide prone in proposed management areas that may alter soil-hydrologic processes. Design management actions to avoid the potential for triggering landslides (Forest Plan p. III-23, SWST12).	Provide for stream channel integrity, channel processes, and the sediment regime under which the riparian and aquatic ecosystems evolved.	Project design, mitigation measures
Conduct field verification to delineate perennial and intermittent streams, seeps, springs, and bogs for riparian and wetland buffers (*FSM 2520).*	Ensure protection of riparian areas and wetlands.	Level II Riparian Inventory mapping to determine flow regime. Timber sale layout will further verify flow regime and delineations and determine project design.
Conduct site-specific analysis or field verification of landslide-prone models to identify areas of landslide prone in proposed management areas that may alter soil-hydrologic processes. Design management actions to avoid the potential for triggering landslides (*Forest Plan p. III-23, SWST12).*	Avoid altering vegetation or hydrologic conditions on landslide prone areas and increasing potential which could increase probability of slope failure.	Project design, mitigation measures

Management Requirements	Objective	Implementation Mechanism
Wildlife		
The Forest shall consult with the National Marine Fisheries Service and Fish and Wildlife Service as needed, and appropriate, to comply with consultation requirements under the Endangered Species and Magnuson-Stevens Act. (Forest Plan p. III-11, TEST01)	Fulfill requirements for consultation regulations	Project design feature
Design and implement projects to meet the terms of Forest Service approved portions of recovery plans. If a recovery plan does not yet exist, use the best information available (for example, BAs, BOs, letter of concurrence, Forest Service–approved portions or Conservation Strategies) until a recovery plan is written and approved. (Forest Plan p. III-11, TEST03)	Ensure the project components meet the intent of the Forest Plan	Project design feature
Mitigate, through avoidance or minimization, management actions within known nesting, wintering, or roosting sites of TEPC species if those actions would adversely affect the survival of wintering or roosting populations. During project planning, determine sites, periods, and appropriate mitigation measure to avoid or minimize effects. (Forest Plan p. III-11, TEST13)	Comply with mitigation measures designed to avoid disturbance of nesting, wintering, or roosting sites.	Project design feature
Range Resources		
After completing vegetation treatments, livestock grazing practices (for example, salting locations, rest, temporary closure of stock water, herding, season of use, duration, and temporary electric fencing) may be altered as needed to hasten or enhance site recovery or treatment (Forest Plan p. III-46, RAGU03).	Minimize impacts from livestock grazing.	Annual Operating Instructions
TES Plants		
Management actions that occur within occupied, sensitive plant species habitat must incorporate measures to ensure habitat is maintained where it is within desired conditions, or restored where degraded (Forest Plan p. III-33, BTST01).	Minimize negative impact to sensitive plant habitat. Restore degraded habitat.	Project design
Cultural Resources		
Avoid all known cultural sites during project implementation. If a new cultural site is discovered during the project, stop activities in the area until a Forest Service archaeologist evaluates the site and its importance. Apply any protective measures recommended (National Historic Pres. Act, Forest Service Manual, Forest Plan p. III-69 to III-70).	Protect cultural resources until they can be evaluated for eligibility to the National Register.	Project design
Recreation		
All projects shall be designed to meet the adopted Visual Quality Objectives (VQOs) as displayed on the Forest VQO map. (Forest Plan p. lll – 67, SCST01).	Protect or enhance Forest scenic value.	Project design

2.10 Project Design Features/Mitigation Measures

The project design features and mitigation measures listed in the following table are practices that the ID team developed during this analysis to address site-specific environmental and resource concerns not sufficiently addressed by existing management requirements. Project design features are specific actions designed to address site-specific environmental or resource concerns that were not sufficiently addressed by existing management requirements. Project design features/mitigations occur during or after project implementation and can include avoiding the effect, minimizing the effect by limiting the action, rectifying the effect, reducing the effect through maintenance, or compensating for the effect.

Table 2-5. Project Design Features/Mitigation Measures

Project Design Features		**Objective**	**Effectiveness**	**Enforcement Mechanism/ Responsibility**
FORESTED VEGETATION				
1	In each treatment unit, coarse woody debris (tons per acre) will be evaluated to ensure desired ranges based on PVG. If necessary, material will be left behind of the appropriate size classes to meet standards. When coarse woody debris in the larger size classes is not available for retention in an activity area, smaller size classes may be utilized to meet desired conditions described in Forest Plan Appendix A. These smaller size classes should only be utilized when the resulting fire hazard risk will remain within defined fuels management objectives. Fire hazard risk as it relates to both the activity unit and adjacent areas should be considered.	Forest Plan consistency	Moderate to High: Experience	Silviculturist Contract Administrator Fuels Management Specialist Silvicultural Prescription Contract Burn Plan
2	Management activities shall emphasize: Leave all dead standing trees (snags), unless falling is necessary for safety. Retention of snags away from roads to reduce the potential for removal.	Maintain snags for long-term site productivity and wildlife species	High: Experience	Silviculturist Contract Administrator Fuels Management Specialist Silvicultural Prescription Contract Burn Plan
3	Sufficient live trees of appropriate size should be retained for future CWD and snag recruitment where CWD or snag levels are below desired ranges (to meet Appendix A, PNF Plan).	Move toward desired CWD and snag levels	Moderate to High: Experience	Silviculturist FMS Silvicultural Prescription Burn Plan
4	Retain forest stands that meet the definition of large tree size class. Management actions are permitted in such stands as long as they will continue to meet the definition of a large tree	Ensure movement toward desired tree size	High: Experience	Silviculturist Contract

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
	size class stand.	objectives defined in the Forest Plan.		Administrator FMS Silvicultural Prescription Contract Burn Plan
5	Prior to decommissioning routes or completing long-term closure activities, approval by the District TMA or silviculturist shall be obtained to ensure that utilization of these routes for access, haul and/or skid trail is not necessary to complete any planned or proposed vegetation treatments.	Utilize existing routes to complete vegetation treatments.	Moderate to High: Experience	Hydrologist / Soil Scientist/ District Timber Management Assistant
6	All acres treated with thinning or prescribed fire treatments require a silvicultural prescription. (Forest Service Manual/Handbook Direction)	Ensure movement toward desired conditions to meet stand objectives.	Moderate: Experience	Silviculturist FMS Silvicultural Prescription Burn Plan
7	The Lost Valley and Boulder Creek progeny sites will have treatments designed to continue the use of the stands for research and for the Regional Tree Improvement Program.	Protect the integrity of long-term inventory plots, and high-value tree improvement trees.	High: Experience	Silviculturist Silvicultural Prescription

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
SOIL, WATER, RIPARIAN AND AQUATIC RESOURCES				
SWRA - Vegetation Treatments				
8	The project has selected Option 2 (Appendix B of the Forest Plan) in the step-down process to delineate RCAs associated with a Forested fish-bearing stream. Option 2 uses two site-potential tree heights (240 feet) for perennial streams and intermittent streams providing fish habitat. One site potential tree height (120 feet) would be applied to intermittent streams (not providing seasonal fish habitat). Buffers (RCAs) would also be applied to any unmapped streams discovered during implementation.	Maintain riparian function (including Bull Trout, Steelhead and Chinook salmon designated critical habitat where applicable).	High: experience, logic, Belt *et al.* 1992, McDade *et al.* 1990. Gregory *et al.* 1991.	Contract Administrator, Contract, Fisheries Biologist or Hydrologist.
9	No harvest or related equipment operations (unless on a system road prism) would occur within 240 feet of perennial stream channels (and intermittent channels providing seasonal fish habitat) or within 120 feet of intermittent stream channels outside of Boulder Creek and unless identified as an area for RCA vegetation treatments. Standard RCA Buffers would also be applied to any unmapped RCAs discovered during implementation. If activities in RCAs are necessary for implementation of vegetation treatments (such as existing unauthorized roads, temporary roads to connect harvest units to existing roads, skyline anchors, new skid trails or landings within RCAs) those actions would be evaluated and approved by a fisheries biologist or hydrologist. Hydrologist or fisheries biologist will provide site specific mitigation or design feature to minimize or mitigate effects to riparian resources.	Maintain riparian function (including Bull Trout, Steelhead and Chinook salmon designated critical habitat where applicable).	High: experience, logic, Belt *et al.* 1992, McDade *et al.* 1990. Gregory *et al.* 1991.	Contract Administrator, Contract, Fisheries Biologist or Hydrologist.
10	The following guidelines would generally be used for RCA treatment layout and implementation: 1. Only upland vegetation in the outer portion of the RCA would be treated with intermediate silvicultural treatments. 2. Along intermittent streams, thinning and limited equipment use could only occur in the outer 60 feet of the RCA. Generally, no cutting of vegetation would occur within 60 feet of the stream. 3. Along perennial streams, thinning and limited equipment use could only occur in the outer 120 feet of the RCA. Generally, no cutting of vegetation would occur within 120 feet of the stream. No ground-based harvest is allowed in RCAs unless otherwise approved by aquatics or soils specialist. Jammer or skyline yarding would be completed from existing roads or from outside the RCA, unless otherwise	Maintain riparian function (including Bull Trout, Steelhead and Chinook salmon designated critical habitat where applicable).	High: experience, logic, Belt *et al.* 1992, McDade *et al.* 1990. Gregory *et al.* 1991.	Contract Administrator, Contract, Fisheries Biologist or Hydrologist.

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
	approved. 4. No harvesting would be allowed in the no-cut zones. Cutting of individual trees within the no-cut zone may be approved in rare instances on a case-by-case basis but no removal of that material would be permitted. 5. RCA treatments would create a transition zone between harvest units and the "no cut" zone. Transition zones would maintain adequate recruitable LWD and shading to stream channels. 6. RCA treatments would not reduce canopy cover more than 20 percent from existing condition. Site specific prescriptions would be developed in consultation with the district fish biologist and/or hydrologist to ensure that riparian functions are maintained. 7. RCAs discovered during layout may be considered for treatment if: 1) they meet the intent of RCA treatments; 2) all project design features and restrictions can be adhered to; and 3) They fall outside of the Boulder Creek drainage.			
11	No prescribed fire treatments (direct ignition or ladder fuel treatments) would occur within RCAs in the Boulder Creek subwatershed. In the remaining portions of the Project Area, ignition operations within RCAs shall be implemented to maintain RCA function and processes by creating a mosaic of burned and unburned areas, minimizing severity and intensity; maintaining stream-shading vegetation; retaining adequate ground cover and sediment filtering capacity; and maintaining current and recruitable large and coarse woody debris. In RCAs identified for treatment, no ignitions within 120 feet of perennial stream channels or within 60 feet of intermittent stream channels will occur. Direct ignitions could occur anywhere in any RCA if needed to contain fire spread. Ignition operations should generally only occur in the outer portions of RCAs in the drier PVGs where fuels reduction is needed to increase the resiliency of the RCA and reduce the potential for high intensity/severity wildfire. If any areas are not capable of carrying fire or maintaining RCA function and processes (as described above) at the time of fire application, fire will not be applied. Ladder fuel treatments conducted as part of prescribed burning activities may be implemented to protect the overstory from effects of prescribed fire and to meet	Maintain riparian function (including Bull Trout, Steelhead and Chinook salmon designated critical habitat where applicable).	High: experience, logic, Belt *et al.* 1992, McDade *et al*. 1990. Gregory *et al*. 1991.	Contract Administrator, Contract, Fisheries Biologist or Hydrologist, FMS, Burn Plan

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
	prescribed fire objectives. Ladder fuel treatments- would only occur in RCAs where active ignition is anticipated and would not occur within riparian vegetation, within 60 feet of intermittent channels or within 120 feet of perennial stream channels. All ladder fuel treatments in RCAs will be completed by hand and would not cut trees larger than 8 inches DBH. Slash produced from ladder fuel treatments will be lopped and scattered. Piling of slash will not occur within RCAs. No construction of mechanical (heavy equipment) fireline shall occur in RCAs and handline should be minimized in RCAs through the use of existing roads, natural vegetation features and the use of hose lays where appropriate as an alternative to fireline construction. Promptly (as soon as perimeter control is no longer necessary) reclaim all fireline following all burn activities. Reclamation activities will include, but is not limited to, placing waterbars as necessary, pulling material removed including mineral soil for fireline construction back onto fireline, pulling slash as available onto the surface All burn plans and anticipated ladder fuel treatments will be annually reviewed by District Resource Specialists (fisheries biologist and hydrologist). Additional site-specific concerns regarding prescribed fire treatments (including RCA treatments) will be addressed at that time.			
12	No refueling or storage of fuel or other toxicants within RCAs unless approved by a fisheries biologist and/or hydrologist. Unattended equipment should not be parked in RCAs unless no other practical options are available.	Minimize potential for fuel spill in stream.	High: Logic	Contract Administrator, contract provision, Fisheries Biologist, Hydrologist.
13	Additional mitigation (e. g. water bars, slash filter windrows, straw bales) will be applied to temporary road and skid trails left open over the winter to stabilize the soil and minimize erosion during spring runoff.	Minimize sediment delivery to stream channels	High, Logic, Experience	Contract Administrator, Timber Sale Contract.
14	Locate and approve water drafting sites prior to use. The project fisheries biologist or hydrologist must approve the sites. No vehicles would be allowed in stream courses at any time for the purpose of withdrawing water. A maximum 3/32 inch screen mesh will be required on all water drafting equipment.	Minimize impacts to stream channels and RCAs	High: Experience, Logic	Contract Administrator, Fisheries Biologist, Hydrologist.
15	If snow conditions allow, use snow bridges as an alternative to road construction and culvert placement. Where a culvert is needed on temporary road, it would be removed in the same field season as installed unless	Minimize sediment delivery to channels and	High: Experience, Logic, Burroughs	Contract/Administrator

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
	approved by the fisheries biologist, hydrologist or qualified designee.	rehabilitate riparian areas. Reduce levels of TSRC	And King 1989, Foltz 2007, Local Monitoring.	
16	On slopes greater than 45% utilize cable, skyline or helicopter harvest systems and limit heavy equipment operations to roads (temporary or permanent) and landings.	Reduce soil impacts and levels of DD by utilizing lower impact harvest systems.	High: Seyedbagheri 1996, Megahan 1987, Experience	Silviculturist / TMA Contract Administrator Silvicultural prescription Contract
17	On slopes less than 45%, ground based mechanical logging equipment (e.g. – feller bunchers, skidders, loaders, processors) must be kept on roads, landings and designated skidtrails at all times unless agreed in writing. Equipment operation off of designated roads, trails and landings will be considered in the following situations: • When soil moisture is below 20 percent. This can be determined when soil is dry to the touch and does not form a ball when pressure is applied by hand. OR When the ground is snow covered and/or frozen sufficiently so that soils will not be unacceptably rutted, displaced or compacted. • Use of mechanized equipment (e.g. – feller-buncher, excavator for machine piling) off of designated skid trails on slopes between 35 and 45% slope should only be considered when existing DD is less than or equal to 10 percent and requires approval of a Forest Service Soil Scientist. The Forest Service will determine when the soils are too wet to operate on designated skidtrails.	Limit detrimental disturbance (e.g. soil compaction, displacement and rutting) to soils.	High: Literature, USDA Forest Service 2002, USDA Forest Service 1981, Garland 1983, Froehlich et. al. 1981 Froehlich et. al. 1983	Soil Scientist Silviculturist / TMA Contract Administrator Silvicultural prescription Contract
18	If surveys indicate that some units have DD levels at or in excess of, 15 percent, it is required that a net reduction in DD be accomplished with the implementation of the project (Forest Plan Standard SWST02). The units may require an alternative method of site preparation (*i.e.* broadcast burning). Units that may exceed 15 percent after logging or brush disposal will need to be evaluated prior to brush disposal to determine if piling or broadcast burning will be implemented.	Limit detrimental disturbance (e.g. soil compaction, displacement and rutting) to soils.	High: Literature, USDA Forest Service 2002, USDA Forest Service 1981, Garland 1983, Froehlich et. al. 1981 Froehlich et. al. 1983	Soil Scientist Silviculturist / TMA Contract Administrator Silvicultural prescription Contract

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
19	Maintain spacing of approximately 200 feet or greater for constructed skid trail routes except where converging at landings. Keep excavations of constructed skid trails to a minimum. Maintain spacing of 100 feet for designated lateral trails. Closer spacing due to complex terrain must be approved in advance by the Timber Sale Administrator. Give preference to reutilizing and decommissioning existing skid trails.	Reduce soil impacts by restricting the amount of surface area covered with skid trails.	High: Literature, Froehlich *et al*. 1981, Garland 1983	Silvicultural Prescription, Contract, Silviculturist, Contract Administrator
20	Constructed skid trails will not exceed a 30% road grade except for short pitches, should be kept to a minimum, unless otherwise agreed in writing.	Minimize potential for detrimental disturbance.	High; logic, experience, local monitoring, Froehlich *et al*. 1983; Garland 1983.	Contract Administrator, Timber sale contract
21	Maintain long-term rooting strength on identified LSP areas. Favor deep rooted species such as ponderosa pine and Douglas Fir. Avoid road and skid trail construction on LSP areas and concentrating water onto LSP areas from road drainage.	Reduce potential for landslides by retaining rooting strength.	Moderate: Burroughs and Thomas 1977	Contract Administrator Soil Scientist Hydrologist
22	Reclaim disturbed skyline/cable corridors by pulling soil berms back to original configuration and scattering slash on all areas of soil disturbance to provide for a 50 to 80 percent effective cover. Ensure runoff is not channelized into skyline corridors from landing areas.	Reduce potential for erosion/rutting/ DD in corridors and facilitate revegetation.	High; experience, local monitoring.	Contract Administrator Soil Scientist Hydrologist
23	Trails for excavator slash piling are limited to one equipment pass and must be spaced at least 100 feet apart. For placement of slash piles, favor previously disturbed areas.	Reduce displacement and compaction damage to soils.	Moderate: Experience	Silvicultural Prescription, Contract, Silviculturist, Contract Administrator
24	Construct slash filter windrows at the toe of fill slopes on newly constructed landings and temporary roads within contributing areas, concurrent with construction. Limit the height of windrows to less than three feet; dispose of excess material as necessary. Provide breaks (every 100-300 feet) and limit length of windrows to allow easy passage of wildlife and recreationists.	Minimize the extent of sediment routing to stream channels.	Moderate: Literature, Burroughs and King 1989, Cook and King 1983, Forest Service Handbook 2509.22, p. 15.02-	Silvicultural Prescription Contract, Transportation Plan Silviculturist, Contract Administrator, Engineering Representative

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
			2.	
25	Decommission all landings, skid trails, and firelines used in project implementation activities. Rip (loosen) compacted soils to a maximum 16 inches, or depth of compaction with a maximum of three foot spacing between rips. Where practicable, recontour to the natural slope profile for decommissioning of roads, constructed skid trails and temp roads and waterbar as needed to prevent erosion. Hydromulch or pull slash over the surface to achieve 50 percent ground cover prior to seasonal runoff events. Range and recreational access should be maintained where needed.	Restore and stabilize committed soils back to productive condition.	High: Literature, Johnson 1995, Luce 1997, USDA Forest Service 1981	Silvicultural Prescription, Contract, Silviculturist, Contract Administrator
26	Apply a high level of mitigation to areas where land-disturbing activities may deliver sediment to stream channels or RCAs, or where activities increase detrimental disturbance or total soil resource commitment (TSRC). Mitigation measures can include, but are not limited to, water control devices such as silt fence or straw bales, erosion control matting, seed, hydromulch, fertilizer, placement of woody debris, and breaking up compacted soils. Maintain or modify mitigation structures to keep them in a fully functioning condition. Remove silt fence and stabilize disturbed areas post-implementation.	Minimize sediment delivery.	Low to Moderate: Experience; Literature, Burroughs and King 1989	Contract, Contact Administrator, Engineering Representative
27	Fuel storage greater than 200 gallons will be located within a containment area lined with material sufficiently impervious to contain spilled fuel.	Reduce potential for fuel spills that could affect fish or fish habitat. 40 CFR 112	Moderate: Experience.	Contract Contract Administrator
28	Approved oil-absorbing mats would be available and used as necessary to clean up spills that occur during refueling and to catch or clean up fuel/oil drips under stationary equipment.	Minimize contamination of soil and water resources.	High: Experience.	Contract Contract Administrator
SWRA - Prescribed Fire				
29	Avoid tree mortality and high soil burn severity from prescribed fire operations in identified landslide prone (LSP) areas.	Reduce potential for landslides by retaining rooting strength.	Moderate: Burroughs and Thomas 1977	Burn Boss Soil Scientist, Hydrologist
30	Implement prescribed burning operations when adequate soil moisture exists, and fuel loading and residence time will result in low soil severity.	Reduce the potential for severely burned soil.	Moderate; Experience	Silviculturalist, Burn Boss
Culvert Replacement/Removal				
31	Culvert removals and installations (including those implemented to improve fish passage and crossings on	Minimize sedimentation	High; logic,	Contract Administrator,

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
	closed roads re-constructed for vegetation management) will follow the mitigation measures outlined in the Programmatic Culvert Replacement BA (Scaife and Hoefer, 2011) and are incorporated into these design features. Culverts or other crossing structures would be installed at low flows. For permanent culverts, incorporate elements of the natural channel, such as substrate size and gradient, when reconstructing channels where fish habitat or potential fish habitat exists. The following permits will be acquired prior to project implementation: variance letter to exceed turbidity levels from Idaho department of Environmental Quality, stream channel alteration permit from Idaho department of Water Resources. In addition, a 404 dredge and fill permit will be obtained from the USACE.	and effects to listed fishes and designated critical habitat.	experience	Fisheries biologist (or qualified designee) Hydrologist, Wildlife Biologist Engineer
32	Culvert installation or removal in live streams would occur after spring peak flows and prior to August 15 (in the Boulder Creek subwatershed) to avoid the bull trout spawning period). Stream channels will be de-watered prior to in-stream work with heavy machinery. Streams would be diverted for a period consistent with the programmatic stream crossing consultation. Streams would likely be diverted using a corrugated plastic pipe or a plastic-lined channel and a temporary cofferdam. If water drafting is necessary, screen opening size would be the standard 3/32 inch or smaller (as required by the PAF Forest Plan). The culvert design team will specify stockpiling and staging areas and access to the site will be on an established roadway. Some trees may have to be felled within the RCA to complete construction, however, the number of trees cut will be minimized to the extent possible.	Minimize sedimentation and effects to listed fishes and designated critical habitat.	High: logic, experience, Scaife and Hoefer 2011.	Contract Administrator, Fisheries Biologist
33	Prior to culvert installation or removal activities, a pre-work survey will be conducted by the District Fisheries biologist and/or qualified designee. Passive movement of fish from the construction area will be achieved by slow dewatering of the site. If this method is insufficient, then block nets will be installed, and fish observed in the project area will be removed from the area using dipping, seining, and/or electrofishing methods. Fish would be transported to an unaffected portion of the creek above the in-stream work and released. Block nets would be removed after fish removal. A fish biologist will oversee all fish handling operations.	Minimize effects of in-stream construction on Listed Fishes.	High; logic, experience	Contract Administrator, Fisheries Biologist
34	During culvert installation or removal activities, a spill containment kit will be available on-site and able to accommodate potential spills for the equipment used during implementation. No fuels would be stored in RCAs, unless there is no other alternative. Refueling or servicing of vehicle or equipment would not take place in	Minimize effects to water quality.	High: logic, experience	Contract Administrator

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
	RCAs. All equipment will be in good repair and free of leakage of lubricants, fuels, coolants and hydraulic fluid. In-stream work with heavy machinery would be minimized to the extent possible. Detectable sheens will be reported to the EPA and any spills over 25 gallons will be reported to the IDEQ.			
35	During culvert installation, Sedimat® or similar product would be placed within the channel to collect released fine sediments and minimize effects to downstream segments. These would be removed from the channel at the conclusion of activities. Sediment control measures may also include silt fences, erosion control matting, mulch, straw wattles, and/or slash. The culvert/bridge installation or removal and associated activities would be conducted in a manner that would minimize the potential for inputting addition fine sediments or affecting riparian habitat. Stream simulation material would be washed, *i.e.* sprayed with water using a pump and hose, to settle fine material into the streambed to minimize loss of downstream surface water and to minimize turbidity. Sedimat® will be placed downstream to capture sediment and will be removed when construction is complete. It is not anticipated that explosives would be used because the culverts/bridges are designed with a relatively shallow foundation system.	Minimize sedimentation and effects to listed fishes and designated critical habitat.	High: Logic, Experience	Contract Administrator, Fisheries Biologist
36	Culvert replacement/removal site rehabilitation will includes seeding and mulching the disturbed area. Straw wattles may also be used to stabilize the road fill. All project related materials and waste will be removed from the site when construction is complete.	Minimize sedimentation and effects to listed fishes and designated critical habitat.	High: logic, experience	Contract Administrator, Fisheries Biologist
Road Reconstruction				
37	When constructing or re-constructing roads in RCAs or installing culverts, use sediment fences, wood straw, jute matting or other erosion control measures deemed necessary by a fisheries biologist and/or hydrologist (or designee). Gravel road stream crossings and armor ditch lines where necessary to inhibit erosion. Gravel road sections for the full extent of the contributing road surface, or within the RCA, whichever is greater.	Reduce sediment input to stream channels, maintain aquatic organism passage.	High: logic, experience	Contract Administrator, Hydrologist, Fisheries Biologist or qualified designees.

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
38	All new stream crossings (including temporary stream crossings on closed roads opened for vegetation management) would be required to provide fish passage at all fish-bearing streams. SWST08 states "Fish passage shall be provided at all proposed and reconstructed stream crossings of existing and potential fish-bearing streams unless protection of pure-strain native fish enclaves from competition, genetic contamination, or predation by exotic fishes is determined to be an overriding management concern." Fish bearing streams will be determined by pre-construction fish surveys. Culvert installations will follow the mitigation measures outlined in the Programmatic Culvert Replacement BA (Scaife and Hoefer 2011).	Reduce sediment input to stream channels, maintain aquatic organism passage.	High: logic, experience	Contract Administrator, Hydrologist, Fisheries Biologist or qualified designees.
39	Any roads not identified as haul routes that will be used as such will need approval by the fish biologist or hydrologist. Adequate reconstruction to mitigate erosion concerns must occur before use.	Minimize sediment delivery to stream channels.	High: logic, experience	Contract Administrator, Hydrologist, Fisheries Biologist or qualified designees.
40	Temporary stream crossings (on closed roads opened for vegetation management that will be closed or decommissioned post-project) would be provided by temporary bridges or partially buried culverts. The use of temporary bridges instead of culvert installations should be considered on streams occupied with Listed fishes and/or DCH.	Reduce sediment input to stream channels, maintain aquatic organism passage.	High: logic, experience	Contract Administrator, Hydrologist, Fisheries Biologist or qualified designees.
41	PDFs for culvert replacements (Scaife and Hoefer 2011) would be applied to culvert installations and post-treatment culvert removal on re-constructed closed maintenance level 1 roads. Closed maintenance level 1 roads temporarily opened for vegetation management that are proposed to return to level 1 closure would have: crossings removed, cut and fill recontoured at stream crossings, drainage features installed and scarifying and reseeding to promote re-vegetation when vegetation management actions are completed. Closed maintenance level 1 roads temporarily opened for vegetation management that are proposed for decommissioning would have all crossings removed when decommissioning treatments take place.	Reduce sediment input to stream channels; retain aquatic organism passage and hydrologic function.	High: Logic, experience, Local Monitoring, Folt and Maillard 2003.	Contract Administrator, Fisheries biologist, Hydrologist or qualified designee(s).
42	Closed system roads that are opened for vegetation management activities and scheduled for long-term closure would be prepared for closure by physically closing to prohibit motorized use, scarifying the driving surface, seeding or hydro-mulching the surface, cut slopes	Reduce long-term sediment production, retain aquatic organism	High, logic, experience, local monitoring, Folt and	Fisheries Biologist, Soil Scientist, Hydrologist.

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
	and fills slopes where necessary, installing waterbars as needed and pulling culverts where necessary. All culverts installed to facilitate use of the road would be removed, using the PDFs for culvert removal in the Programmatic Culvert Replacement BA (Scaife and Hoefer, 2011).	passage and hydrologic function	Maillard 2003.	
Road Decommissioning/Obliteration				
43	Permanent and temporary roads identified for obliteration would be decompacted a depth of 16" or the extent possible, recontoured, seeded with native seeds (where need is identified), and provided with a minimum of 50% to maximum of 80% ground cover (vegetation transplants at a rate of 15 per 100 linear feet, natural mulch, CWD, or wood straw, in that order of preference) to an extent deemed necessary by a fisheries biologist and/or hydrologist. In addition to the above treatment, stream crossings would receive planted vegetation plugs and additional ground cover to an extent deemed necessary by a fisheries biologist and/or hydrologist, to reduce erosion, facilitate recovery of soil biological function and stabilize streambanks. Temporary roads will be fully obliterated within 3 years of the conclusion of harvest activities, unless otherwise agreed in writing.	Minimize sediment delivery to stream channels and rehabilitate riparian areas. Reduce levels of TSRC	High: experience, logic. Burroughs and King 1989, Foltz 2007, local monitoring	contract provisions, Hydrologist, Fisheries Biologist
44	Removal of crossings on perennial streams will follow the mitigation measures outlined in the Programmatic Culvert Replacement BA (Scaife and Hoefer, 2011)	Minimize sedimentation and effects to listed fishes and designated critical habitat.	High; Experience, logic	Contract provisions, Contract Administrator, Fisheries biologist
Road Maintenance				
45	All road maintenance activities in the Boulder Creek subwatershed would follow all mitigations contained in the programmatic consultation (Olson and Burns 2007). Gravel road stream crossings and armor ditch lines where necessary to inhibit erosion. Gravel road sections for the full extent of the contributing road surface, or within the RCA, whichever is greater. Roads that will be used as haul routes then decommissioned or placed into long-term closure should have BMPs applied where identified as delivering sediment to stream channels. Mitigation measures may include, but are not limited to, graveling of road prism in RCAs, armoring ditch lines with pit run, and placing obstructions or constructing catch basins below culverts.	Minimize effects to listed fishes and fish habitat	High: Experience, logic	Contract provisions, Contract Administrator, Fisheries biologist, Hydrologist
46	All roads identified as haul routes (including roads that will remain open and those identified to be decommissioned or placed in long-term closure) that cross streams occupied with Listed species or DCH (Boulder Creek subwatershed) should have	Minimize effects to listed fishes and fish habitat	High: Experience, logic	

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
	BMPs applied to minimize sediment delivery to occupied and DCH. BMPs may include graveling stream crossings and armoring ditch lines up to the entire extent of the RCA if necessary, placing obstructions and/or rolling dips, installing silt fence, applying mulch and/or slash and seed to exposed soil, installation of silt fence and constructing catch basins below culverts. All silt fencing and other non-biodegradable materials should be removed when hauling is complete.			
47	New Gravel Pits and expansion of existing gravel pits will not occur within RCAs.	Minimize effects to riparian areas and fish habitat	High, Experience, Logic	Contract provisions, Contract Administrator, Fisheries biologist, Hydrologist
48	Utilize all applicable Best Management Practices (BMPs) and Soil Water Conservation Practices (SWCPs) for harvest, road and ground disturbing activities.	Reduce levels of soil disturbance, erosion and potential sedimentation, meet requirements of the State of Idaho non-point source pollution Management Plan, Maintain, water quality and associated beneficial uses.	High: FSH 2509.22, Local Monitoring.	Contract provisions, Contract Administrator, Fisheries biologist, Hydrologist
Threatened, Endangered, Proposed and Candidate Species, and Region 4 Sensitive Species				
49	Ground disturbing activities would be stopped in any areas where previously unknown listed or sensitive fish, wildlife, or botanical species are discovered until a Fisheries Biologist, Wildlife Biologist, or Botanist, respectively reviews the affected area and prescribes appropriate mitigation to ensure protection of the species (including any consultation requirements with USFWS and/or NOAA Fisheries).	Provide protection to threatened, endangered and sensitive species.	Moderate: Logic	WIGU07 Fisheries Biologist, Wildlife Biologist, Botanist, Sale Administrator, Burn Plan, Fire Management Officer
WILDLIFE				
50	The following activities are prohibited at all times in occupied NIDGS habitat, unless approved in writing by the wildlife biologist:	Mitigate potential effects to NIDGS from		Contracts, Wildlife Biologist,

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
	- camping, - piling of slash (outside of approved landings).	habitat restoration associated management activities		Contract Administrator, Burn Plan, FMO
51	In occupied NIDGS habitat from April 1 to August 31management activities that may cause unacceptable disturbance to active NIDGS are prohibited unless approved by a FS wildlife biologist following appropriate consultation and/or communications with the USFWS. This includes, but is not limited to: off-road parking, thinning, skidding, decking logs, creation of landing piles, loading/unloading equipment off of the road, construction of hand fireline and prescribed burning. These dates may change depending on the emergence or torpor of NIDGS as determined by the wildlife biologist. Approval to complete these and other activities during this period in occupied habitat require written permission a FS wildlife biologist and may require consultation with the USFWS.	Mitigate potential effects to NIDGS from habitat restoration activities	Moderate-High: Research, literature, Forest Plan, agency direction, logic	Contracts, Wildlife Biologist, , Contract Administrator, Burn Plan, FMO
52	In occupied NIDGS habitat: - Constructed skid trail must be approved prior to implementation. - Skid trail and temporary road obliteration in occupied NIDGS habitat shall not fully obliterate or recontour the slope unless previous approval from the wildlife biologist is obtained. - Require only outsloping, scarification and spreading organic material when concerns regarding obliteration and burrows conflict.	Mitigate potential effects to NIDGS from skid trails and temp roads	Moderate-High: Research, literature, Forest Plan, agency direction, logic	Contracts, Wildlife Biologist, , Contract Administrator, Burn Plan, FMO
53	In occupied NIDGS habitat, management activities with the potential to affect inactive NIDGS (hibernating in burrows) shall occur between May 1 and August 31, unless otherwise approved by a wildlife biologist. These activities include ground disturbing activities that could potentially affect greater than 6 inches to one foot in depth and include activities such as: decommissioning of roads or trails, skid trail construction / obliteration and mechanical fireline construction. These activities are likely to disturb NIDGS while hibernating in burrows, therefore, operations will not be allowed until pups have emerged from hibernation as determined by the wildlife biologist.	Mitigate potential effects to hibernating (below ground) NIDGS from ground disturbing activities	Moderate-High: Research, literature, Forest Plan, agency direction, logic	Contracts, Wildlife Biologist, , Contract Administrator, Burn Plan, FMO
54	Hauling of logs and other forest products in occupied NIDGS habitat may occur: 1) With no restrictions from September 1 through March 30. 2) With written approval of the wildlife biologist	Mitigate potential effects to NIDGS from commercial product haul	Moderate-High: Research, literature, Forest Plan, agency	Timber Sale Contract, Wildlife Biologist, TMA, Sale Administrator,

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
	between April 1 and August 31 and only after site specific evaluation and mitigation is applied. The following are potential mitigation measures that may be applied to allow haul during this time period: a) Reduced speed limits; and/or b) Limiting the time of day for haul to when squirrels are inactive; and/or c) Other mitigation as recommended by the Forest Service and approved through consultation with the USFWS. Roads associated with the project will be monitored by qualified FS personnel to determine hazards and compliance. If mitigations are determined to be ineffective at protecting squirrel populations, commercial product haul would be limited to the inactive period (September 1 through March 30).		direction, logic	Burn Plan, FMO
55	In occupied NIDGS habitat when NIDGS are inactive (typically September 1 through March 30), management activities requiring the use of heavy equipment off the road surface (i.e. – skidders, dozers, feller-buncher) shall comply with the following requirements, unless otherwise approved by a FS wildlife biologist. This includes, but is not limited to, activities such as: logging, mechanized harvest, parking of heavy equipment, skidding, decking, landing slash piling is allowed between if the following conditions are met: 1) Notification to Forest Service by the contractor is made prior to August 1 that winter logging will occur (skid trail and landing locations must be flagged by the contractor); AND Potential skid trail locations shall be surveyed and approved by the wildlife biologist (or their designee) prior to logging to avoid damage to burrows. **OR** 2) When squirrels are known to be present but surveys were unable to identify burrows locations, biologist may require frozen/over snow logging, which is defined as: at least 18 inches of snow and/or 4 inches of frozen soil.	Mitigate potential effects to NIDGS habitat restoration activities Compliance with Section 7 consultation	Moderate-High: Research, literature, Forest Plan, agency direction, logic	Timber Sale Contract, Wildlife Biologist, TMA, Sale Administrator, Burn Plan, FMO
56	In modeled potential NIDGS habitat, unless modeled potential habitat has been field verified as non-suitable or surveys have been completed and no squirrels documented, mitigations 50-53from this table shall apply. Seasonally, the wildlife staff will conduct on-site surveys approximately three times within a 7 day period to identify the presence of NIDGS. In potential habitat when the wildlife biologist deems	Mitigate potential effects to NIDGS in potential habitat.	Moderate-High: Research, literature, Forest Plan, agency direction, logic	Timber Sale Contract, Wildlife Biologist, TMA, Sale Administrator, Burn Plan, FMO

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
	potential habitat unsuitable or surveys are completed and NIDGS are not documented, project restrictions for NIDGS will not apply.			
57	In occupied habitat and potential habitat within ¼ mile of occupied sites, unless otherwise agreed in writing: - No slash piles will be built within ¼ mile of occupied NIDGS habitat unless they are to be chipped and hauled away. - Chipping will take place after NIDGS are inactive when soil moisture is less than 20 percent or frozen. - Care shall be taken not to disturb soil when removing chip material even if it means leaving some material on the landing. - All slash outside of approved piles, within occupied habitat shall be uniformly distributed (lopped and scattered) to a depth of less than two feet to reduce heat transfer to soil.	Mitigate potential effects to NIDGS in from slash treatment		
Northern Goshawk and Great Gray Owl				
58	Known northern goshawk (NOGO) nests will be protected within a 30-acre forested nest stand as determined by the wildlife biologist in coordination with the sale administrator and/or timber staff. During vegetation management operations, if a new NOGO nest is located, onsite activities will cease until a survey can determine if the nest is active. If the nest is active, operations in those 30 acres will be halted until the end of the nesting season (March 1 to Sept. 30). Operations may resume earlier than Sept. 30 if it is determined that the birds are no longer present. As per PNF Plan direction, nest stands will have a Post-Fledging Area (PFA) established. Refer to the Project Record for nest site locations, PFA protocol and associated units.	Compliance with Forest Plan direction	High: Research, literature, Forest Plan, agency direction, logic	Timber Sale Contract, Wildlife Biologist, TMA, Sale Administrator, Burn Plan, Fuels Specialist
59	Great gray owl nesting sites that have not been identified prior to vegetation or Rx fire treatments, may require protected activity centers (PAC's) to retain nesting and rearing habitat that is sufficient to rear fledgling great gray owls e.g. PVG 6 clumps w/in 300 ft. of meadow habitat specifically near Lost Valley Reservoir, Price Valley and Bear Wallow areas.	Minimize negative effects on wildlife primarily during nesting	Moderate: Research, Literature, Administrative studies, Logic	Timber Sale Contract, Wildlife Biologist, TMA, Sale Administrator, Burn Plan, Fuels Specialist
General Big Game				
60	In areas closed to public motorized access, motorized access by contractors shall be only for purposes of implementing the contract. Use of restricted roads and unauthorized equipment for activities such as personal use firewood collection and big-game hunting are prohibited. Apply periodic management activity restrictions between	Minimize negative effects on wildlife; ensure contractors do not have an	High: Research, literature, Forest Plan, agency direction,	Timber Sale Contract, Wildlife Biologist, TMA, Sale Administrator,

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
	May 1 and July 15 in active fawning/calving areas to protect big game during these periods.	unfair advantage during hunting season	logic	Burn Plan, Fuels Specialist
Elk				
61	As per Forest Plan direction (WIGU08), provide a radius of 2 elk sight distances (total of 400 feet) of vegetation to protect mineral licks and elk wallows. No harvest or prescribed burning will be allowed in these sites, without approval by the wildlife biologist.	Minimize vulnerability to hunting mortality and provide habitat security	High: Research, literature, Forest Plan, agency direction, logic	Timber Sale Contract, Wildlife Biologist, TMA, Contract Administrator, Burn Plan, Fuels Specialist
TEPC/MIS				
62	Prior to any forest management activity, including, but not limited to, the construction of log landings, skid trails, road construction or maintenance, and prescribed fire, the wildlife biologist, must conduct onsite surveys to identify TEPC, MIS, or Sensitive species presence. Project activities may be altered to protect the wildlife species, as practicable.	Minimize negative effects on wildlife primarily during nesting/den periods	Moderate: Research, Literature, Administrative studies, Logic	Layout, contract, Administrators, Wildlife Biologist, burn plan,
63	During all activities, retain existing snags unless deemed a safety hazard. Felled trees, deemed as hazard trees, will be left on site.	Ensure adequate habitat for snag dependent species	Moderate: Research, Literature, Administrative studies, Logic	Layout, contract, Administrators, Wildlife Biologist, burn plan,
Legacy Tree/Old Forest				
64	Ponderosa Pine, western larch and Douglas-fir that fit the definition of legacy trees should be retained during harvest.	Retain legacy trees for wildlife habitat.	Unknown	Timber Sale Contract, Wildlife Biologist, TMA, Contract Administrator, Burn Plan, Fuels Specialist
65	Retain forest stands that meet the definition of old forest habitat for the applicable PVG as Appendix E of the draft EIS for the WCS. Management actions are permitted in such stands as long as they will continue to meet the definition of old forest habitat.	Ensure retention of old forest habitat as supported by the science in the draft WCS	Unknown	Silvicultural prescription Silviculturist, Wildlife Biologist
Cultural Resources				
66	Avoid all cultural resource sites during project implementation. All sites will be monitored and flagged	Prevent damage to cultural	High; Experience	Timber Sale Contract

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
	prior to implementation to ensure avoidance. If existing surveys are determined to be inadequate, a secondary consultation with Idaho SHPO will be required for: 1) Log and biomass landings 2) Prescribed fireline construction 3) Newly constructed temporary roads 4) Road decommissioning 5) Proposed recreation actions 6) Fish passage barrier improvements and associated road rehabilitation	resource site.		Burn Plans Forest Archaeologist Burn Boss Contract Administrators
Invasive And Noxious Weeds				
67	Annually assess all known and new invasive weed sites associated with this project for five years. Prioritize the sites where treatment will occur.	Detect new and prevent known manageable noxious weeds sites from spreading	High: Experience	Range Management Specialist
68	Coordinate ground disturbing activities annually to address invasive plants management.	To minimize impacts to native vegetation around known invasive weed sites.	High; Experience	Burn Plan Range Specialist Fuels Specialist
Rare Plants				
69	Any rare plant populations identified in the botanical survey will be protected from soil disturbing mechanical treatment, jackpot/pile burning, and decommissioning activities and weed spraying activities.	To minimize impacts to rare plants.	High; Experience	Burn Plan, Timber Sale Contract, Range Specialist Fuels Specialist
Livestock Management				
70	All burn plans and anticipated ladder fuel treatments will be annually reviewed by range program manager. Additional site-specific concerns regarding prescribed fire treatments will be addressed at that time. Ensure that permittees are informed of prescribed burning plans and areas prior to implementation	Minimize impacts to permitted livestock activities	High; experience	Burn plan Range specialist, fuels specialist
71	Protect range improvements within project area. Replace or reconstruct any damaged range improvements to pre-implementation conditions.	Protect investment	High; experience	Timber sale contract/map Burn plan TSA/COR
72	Ensure a passable route (approximately 24 inches wide) is maintained on decommissioned routes to allow for livestock herding and movement within range allotments.	Minimize impacts to permitted	HIGH past experience /	Forest Plan standards and guidelines:

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
		livestock grazing activities.	professional judgment	Contract specifications Range Management Specialist, Contract Administrator
Recreation/Trails				
73	All burn plans and anticipated ladder fuel treatments will be annually reviewed by recreation specialists. Additional site-specific concerns regarding prescribed fire treatments (including RCA treatments) will be addressed at that time.	Minimize effects to recreation resource and infrastructure.	High: experience, logic	Contract Administrator, Recreation Specialist, Engineering, Hydrologist, Fisheries biologist.
74	Trails damaged by vegetative treatments (thinning and prescribed burning) or other activities during project implementation will be repaired by the party inflicting the damage.			
75	All trail maintenance work done during project implementation will abide by the trails "Trail Management Objective" as outlined in the trails database. Trails will be maintained to their proper trail class and trail design features.			
76	Install adequate drainage structures in new trail construction and ensure sediment transport is minimized where trails are located within RCAs, as per FS Trail Construction Specification.			
77	Where necessary, restrict log hauling during periods of high recreation use, such as the opening day of big game hunting season.			
78	On authorized over-snow groomed routes, the contractor would be required to leave a 6 inch snow floor during snow plowing operations and leave the berms far enough apart for passage with a snow groomer. No hauling on over-snow groomed routes would be allowed on weekends or holidays between December 15 and April 1. In addition, no hauling would be allowed on over-snow groomed routes between Christmas and New Year's Day.			
79	The over-snow groomed routes would be signed with information about the logging operations and the information would be posted to the PNF web page.			
80	Trail maintenance in Boulder Creek subwatershed will follow mitigation measures in the programmatic consultation (Olson and Burns 2007).	Minimize erosion and effects to RCAs	High: experience, logic	Recreation Specialist, Fisheries biologist, Hydrologist
81	BMPs (2012 National Core Technical Guide) would be implemented for all ground disturbing activities including installation of vault toilets, hardening dispersed campsites, construction of the trailhead at Ant Basin and installation of kiosks and other recreation related	Reduce/limit levels of soil disturbance, erosion and potential	High: FSH 2509.22, local monitoring	Contract Administrator, Recreation Specialist, Engineering,

Project Design Features		Objective	Effectiveness	Enforcement Mechanism/ Responsibility
	infrastructure.	sedimentation.		Hydrologist, Fisheries biologist.
82	Installation of vault toilets and removal of existing pit toilets should follow programmatic consultation guidelines (Olson and Burns 2007) if located in RCAs in the Boulder Creek subwatershed.	Minimize effects to RCAs	High: experience, logic	Contract Administrator, Recreation Specialist, Engineering, Hydrologist, Fisheries biologist.
83	At the Pollack trailhead install educational signs regarding noxious weeds, including pictures of species of concern. Signs will direct horse users that only "weed free" hay should be used while riding on Forest Service trails	Objective is to reduce risk of noxious weed infestations in the Research Natural Area	High: experience, logic	Recreation Specialist, Range/Weed crew
Scenic/Visuals:				
84	Ridgeline silhouettes in middleground Partial Retention should not have unnatural-appearing breaks along them.	Meet visual quality objectives	Moderate; logic	Contract Administrator, Recreation Specialist,
85	Duration of visual impacts from ground disturbing and vegetation removal activities to allow for herbaceous vegetative recovery of ground cover may extend to three years in foreground Partial Retention and middleground Partial Retention. Consider timely initiation of reseeding in areas where natural recovery is questionable.			
Special Uses				
86	Special uses should be identified on the ground (flagged) and protected during implementation. See Appendix D for locations of Special Uses in the project area.	Protect Special Uses	Moderate; logic	Contract Administrator

2.11 Monitoring and Evaluation

Monitoring and evaluating provides information about the progress and results of project implementation for the decision-maker and the public. The monitoring process involves collecting data to determine if the activity was implemented as described in this chapter, or whether the project activities produce the effects predicted in the scientific analyses presented in Chapter 3.

Monitoring results are evaluated to determine what, if any, adjustments are needed. The Forest evaluates whether the standards and guidelines for each resource are appropriate, and determines whether resource objectives, management directives, and Best Management Practices (BMPs) have been met. If they are not met, the Forest may adjust this and future projects. Table 2-6 summarizes the monitoring that would occur if the proposed action is implemented. Appendix E contains the detailed monitoring and evaluation plans.

Table 2-6. Monitoring

Resource	Item	Priority	Timing	Responsible Personnel	Type
Vegetation	Regeneration exams	High	Year 1, 3 and 5 until regeneration and stocking is certified.	Silviculturist	Effectiveness
SWRA	BMP and SWCP Implementation Monitoring	High	Once per year while logging operations are active at the end of the operating season.	Hydrologist/Fish Biologist	Effectiveness
SWRA	Road Decommissioning	Mod	Post-implementation to insure objectives are met.	Hydrologist Hydro Tech Watershed Restoration Specialist	Implementation
SWRA	DD Monitoring	High	All units shall be evaluated for pre-treatment DD conditions. All units hall be rehabilitated to meet the Forest Plan standard of 15% DD post-treatment...	Soil Scientist	Effectiveness and Implementation
Fisheries/Watershed	Verify that buffers are appropriate width and RCA treatments follow mitigation measures and PDFs.	High	Implementation monitoring will be conducted prior to and/or coincide with activities in RCAs.	Fisheries Biologist/Hydrologist or qualified designee	Implementation Monitoring
Fisheries/Watershed	Determine the effects of RCA treatments on WCIs and effectiveness of PDFs and Mitigation measures designed to maintain RCAs and RCA processes.	High	Effectiveness monitoring will occur during activities and annually for 3 years.	Fisheries Biologist/Hydrologist or qualified designee.	Effectiveness Monitoring
Fisheries	Document culvert replacements and evaluate fish passage at those sites.	High	Upon completion and annually for 3 years.	Fisheries Biologist or qualified designee	Culvert Monitoring

Resource	Item	Priority	Timing	Responsible Personnel	Type
Fire and Fuels	Determine the effectiveness of fire and fuels treatments	High	During and post-activity throughout the project duration	Fire Management specialist or qualified designee	Effectiveness Monitoring
Wildlife	Surveys for TES/MIS and snag retention	High	Prior, during and after ground disturbing activities have concluded.	Wildlife Biologist Wildlife Technician	Effectiveness and Implementation
Wildlife	Road decommissioning, building and closures	High	Prior, during and after ground disturbing activities have concluded.	Wildlife Biologist/Tech	Effectiveness and Implementation
Recreation	On Trail #181, monitor the section of trail through the Pony Creek Research Natural Area for new infestations of noxious weeds.	High	Each year for the first five years following implementation of trail work.	Range Tech	Effectiveness

2.12 Comparison of Alternatives

Table 2-7 displays or compares the alternatives. Acres and miles used in this analysis are approximations based on computer calculations. Actual figures may vary from these planning numbers.

Table 2-7. Alternative Comparison Table

Proposed Actions	Unit	Alt A	Alt B	Alt C	Alt D	Alt E
Vegetation Treatments and Associated Actions						
Commercial Thin-Free Thin	Acres	0	12,200	8,500	14,500	13,200
Free Thin-Patch Cut	Acres	0	1,800	0	0	0
Commercial Thin-Mature Plantation	Acres	0	8,100	6,000	8,100	5,400
Shelterwood with Reserves	Acres	0	0	0	2,600	1,800
Commercial Treatments in Riparian Conservation Areas[3]	Acres	0	1,800	0	2,000	1,600
Non-commercial thinning	Acres	0	18,000	22,000	18,000	12,000
Temporary road construction	Miles	0	30	11	31	15
Prescribed fire						
Prescribed burning	Acres	0	45,000	45,000	45,000	31,500

[3] Riparian Conservation Area treatment acres are not additional acres. These acres are included in commercial thin/non-commercial thin acres.

Proposed Actions	Unit	Alt A	Alt B	Alt C	Alt D	Alt E
Watershed, Fisheries and Wildlife Improvements						
Total fish passage barrier improvements	Number	0	40	40	40	16
System road decommissioning	Miles	0	70	132	70	51
Unauthorized route treatments	Miles	0	90	117	90	90
New long-term closures	Number	0	60	1	12	12
Conversion of seasonally open road to ATV trail	Miles	0	12	12	12	12
Road relocations	Miles	0	1.5	5.0	1.5	0.6
Recreation Improvements						
2-wheel motorized trail	Miles	18	18	18	18	18
Non-motorized trail	Miles	18	18	38	18	18
OHV trail	Miles	0	20	11	20	20
Open road in project area	Miles	265	255	224	255	255
Designate dispersed campsites	Number	0	68	68	68	68
Install information kiosks	Number	0	3	3	3	3
Decommission outhouses	Number	0	6	6	6	6
Install new vault toilets	Number	0	7	7	7	7

2.13 Identification of the Preferred Alternative

Alternative B is the preferred alternative. The Responsible Official's selected alternative for implementation could be this alternative, one of the other alternatives considered in detail, or a different combination of alternatives considered in detail. The final decision will be documented in a Record of Decision (ROD) accompanying the final EIS.

Chapter 3 – Affected Environment and Environmental Effects

3.0 Introduction

Chapter 3 describes the physical, biological, and human resources of the environment that may be affected by the alternatives presented in Chapter 2, and the environmental effects that the alternatives may have on those resources. Affected Environment and Environmental Effects have been combined into one chapter to give the reader a more concise and connected depiction of what resources exist in the project area and what the effects to those resources would be. The environmental effects analysis forms the scientific and analytic basis for the comparison of alternatives shown at the end of Chapter 2. Appendix C contains a list of activities used in the cumulative effects analysis.

Chapter 3 is organized into nine sections, in the following order:

3.1 Forested Vegetation

3.2 Fire and Fuels

3.3 Water Quality

3.4 Soils

3.5 Fish and Fish Habitat

3.6 Wildlife and Wildlife Habitat

3.7 Recreation

3.8 Access Management

3.9 Economics and Socio-economics

3.1 Forested Vegetation

Objective: Move vegetation toward the desired conditions defined in the Forest Plan, with an emphasis on promoting large tree forest structure, early-seral species composition and forest resiliency.

Issue 1: The intensity of the vegetation treatments will affect how well the desired conditions for vegetation and wildlife are achieved.

Indicators/Measurements:

The following indicators/measurements will be evaluated immediately after treatment (i.e. 0-5 years post treatment) and discussed qualitatively for longer term effects (i.e. 5-30 years).

- Tree Size Class
    - Acres treated to promote or maintain the large tree size class.
    - Percentage of area (acres) in each tree size class.
- Canopy Cover
    - Percentage of area (acres) in each canopy cover class within the large tree size class.
- Species Composition
    - Acres treated to maintain and promote desired species composition.
- Spatial Patterns
    - Percent departure from reference conditions per Potential Vegetation Group.

3.1.1 Scope of Analysis

This section focuses on forested vegetation, including upland vegetation in Riparian Conservation Areas (RCAs). Forested vegetation refers to land that contains at least 10 percent canopy cover by forest trees of any size, or land that is presently at an earlier stage of succession. There are approximately 64,600 of forested acres within the project area.

The scope of analysis for direct, indirect, and cumulative effects for the listed indicators is the project area. This includes National Forest System (NFS), private and state land. The analysis area was chosen because it is large enough to represent differences in vegetative characteristics affected by both environmental factors (i.e. – historic fire regimes) and past management activities. The temporal scale of this analysis is 20-30 years post treatment. This is considered an appropriate time scale for analysis because maintenance and future management will need to determine the appropriate objectives for management within the next 15 to 30 years for this project area. In addition, this time period is within the historic disturbance regime for much of the project area. In other words, some disturbance, whether natural or human induced, would be needed to maintain the desired conditions within the next 20-30 years.

The Forest Plan utilizes Potential Vegetation Groups (PVGs) to classify vegetation. PVGs are groups of habitat types that classify the landscape to provide a framework for studying succession or vegetation over time. The Forest used the 1995 inventory strata (with updates) to model PVGs (Miller et. al. date

unknown). This classification allows for a more efficient and operational way to understand the ecological complexity of the landscape by grouping approximately sixty to seventy habitat types into eleven PVGs. Appendix A of the Forest Plan contains a complete description of these PVGs.

Only Potential Vegetation Groups (PVGs) 2, 5 and 6 will be analyzed as they represent the majority of the project area (see Affected Environment section below) and the vast majority of the treatments have been proposed in these PVGs. PVG 1 does have mechanical vegetative treatments proposed on 300 to 600 acres depending upon the alternative but will not be further analyzed because trends in PVG 1 have been found to be similar to PVG 2 at the Forest level scale as well as for this project area. PVGs 1, 3, 4, and 7 through 11 will not be further analyzed because no treatments are proposed in these PVGs as they represent less than ten percent of the project area and are primarily within Inventoried Roadless Area.

All acres and figures in this document are approximations based on GIS data. Differences in values are attributable to rounding.

3.1.2 Desired Conditions

Desired conditions do not represent a static state; they are dynamic because the ecosystem is dynamic. Achievement of desired conditions, well distributed across the planning unit, is a long-term goal of Forest management. The desired conditions for vegetation are described in the Forest Plan, p. III-29-31 (USDA Forest Service 2003).

The Lost Creek Boulder Creek Project incorporates the science and updated data from the draft Wildlife Conservation Strategy DEIS (USDA Forest Service 2011 and 2011a). In some cases there are discrepancies between the Forest Plan desired conditions and those utilized in the draft WCS. In other cases the draft WCS uses new and/or different science, or interpretation of the science than the Forest Plan. The following bullets summarize the primary differences and similarities for each indicator/measurement between the Forest Plan the science utilized in the draft WCS. Where differences do exist, identification of which desired conditions have been utilized in this analysis is made:

- Management Prescription Categories: The Forest Plan identifies approximately 32,000 acres as Management Prescription Category (MPC) 5.2. In the draft WCS, all the MPC 5.2 is proposed to be converted to MPC 5.1 based on the need to conserve habitat for the species of greatest concern. For this project, in order to aid in conserving habitat for the species of greatest concern, the recommendation to manage within the HRV (Morgan and Parsons 2001) has been made. Therefore, this analysis utilizes desired conditions for MPC 5.1 from Appendix A of the Forest Plan (USDA Forest Service 2003, p. A-3 to A-9), in lieu of those for MPC 5.2, when differences exist.
- Tree Size Class: Differences in desired tree size class distributions exist between the Forest Plan and draft WCS. The desired tree size class distributions from the Forest Plan (outside of MPC 5.2) will be utilized as the basis for desired conditions in this analysis.
- Canopy Cover Class: Differences in desired canopy cover class distributions exist in some PVGs covered in this analysis. The Forest Plan desired conditions (outside of MPC 5.2) are being utilized for this analysis.
- Species Composition: The Forest Plan states that the desired species composition values are defined “across all size classes” whereas the draft WCS states that the desired species compositions

apply only to the large tree size class. This analysis compares existing species compositions to the species compositions of all tree size class stands as well as to large tree size class stands only.

- Spatial Arrangement: Additional information and science is referenced in the draft WCS beyond that which is referenced in the Forest Plan. No quantifiable metrics are identified in either document regarding spatial arrangement, but as recommended in the draft WCS, an analysis of spatial arrangement that quantifies the proportion of different age classes or seral stages across the landscape and over time has been completed and provided in this document. Reference conditions for this analysis are based on the science from Morgan and Parsons (2001) regarding HRV in the area.

3.1.3 Existing Condition

Affected Environment

The project area is dominated by forested vegetation, approximately 64,600 acres are forested. Much of the grassland/shrubland also has scattered trees but does not contain the minimum canopy coverage to be considered forest. The project area is dominated by forest types and fire regimes that were historically open ponderosa pine forest with a mosaic of mixed conifer (primarily grand fir, Douglas-fir, and western larch) forest types. The distribution of forest types and historic vegetation in the project area are driven primarily by subtle changes in elevation, aspect, and topography. Prior to European settlement, the principal disturbance process that shaped vegetation distribution, development and succession on the landscape was fire, with insects and other disturbance processes also playing a minor role (Mehl et. al. 1998; Morgan and Parsons 2001).

Table FV-1 identifies the PVGs and their distribution within the project area. Approximately 82 percent of the 64,600 acres of forested vegetation in the project area are classified in PVGs 2, 5 and 6.

Table FV-1. PVGs within the Project Area

Potential Vegetation Group	Acres within Project Area	Percent of Project Area
PVG 1—Dry Ponderosa Pine/Xeric Douglas-fir	1,705	2%
PVG 2—Warm Dry Douglas-fir/Moist Ponderosa Pine	14,174	18%
PVG 3—Cool Moist Douglas-fir	14	<1%
PVG 4—Cool Dry Douglas-fir	0	0%
PVG 5—Dry Grand Fir	12,765	16%
PVG 6—Cool Moist Grand Fir	26,224	33%
PVG 7—Warm Dry Subalpine Fir	7,334	9%
PVG 8—Warm Moist Subalpine Fir	686	<1%
PVG 9—Hydric Subalpine Fir	785	1%
PVG 10—Persistent Lodgepole Pine	883	1%
PVG 11—High Elevation Subalpine Fir	8	<1%
Total Forested Vegetation	***64,598***	***82%***
Grassland/Shrubland	13,223	17%
Other[1]	715	1%
Project Area Total	**78,516**	

1 – Other is non-forested barren, lakes, etc.

The following general descriptions of the dominant PVGs are from the Forest Plan.

PVG 2

This PVG represents warm, mild environments at low to middle elevations, but may extend upward to 6,500 feet on dry, southerly slopes. Ponderosa pine, particularly at lower elevations, or large ponderosa pine mixed with smaller size classes of Douglas-fir are the dominant cover types in this group. Historically, frequent non-lethal fire maintained stands of large, park-like ponderosa pine. Douglas-fir would occur on moister aspects, particularly at higher elevations. Understories are mostly graminoids such as pinegrass and elk sedge, with a cover of shrubs such as common snowberry, white spirea, and mallow ninebark.

PVG 5

This PVG ranges from 4,300 to 6,400 feet in elevation, often on drier upper slopes and ridges. Ponderosa pine and Douglas-fir are common cover types that appear to have been maintained by fire regimes that were historically nonlethal to mixed1. In many areas, this group may have resembled PVG1 and PVG2, with open park-like stands of large ponderosa pine. Mixed species were restricted to small micro-sites that burned less frequently. Understories are similar to PVG 2 in that pinegrass, elk sedge, and white spirea are common.

PVG 6

This PVG ranges in elevation from 3,400 feet to 6,500 feet and represents more moist environments in the grand fir zone. It often occurs next to PVG 5 and the two may intermix with each other, depending on topography. Ponderosa pine is common at the drier extremes of the group, and lodgepole pine occurs in colder areas. Western larch may also be present as an early seral species. Cover types of Douglas-fir and Engelmann spruce also occur in this group. Understories in this group are often shrubby with a conspicuous herb layer also common. Historical fire regimes were mixed ranging from mixed1 to mixed2, in part due to the wide environment this group occupies. Where ponderosa pine was maintained as a common seral species, it appears that fires were more often mixed 1 because ponderosa pine produces a heavy seed that generally disperses only short distances. In other areas where western larch or Douglas-fir were maintained as common seral species, mixed II fire regimes may have been more common.

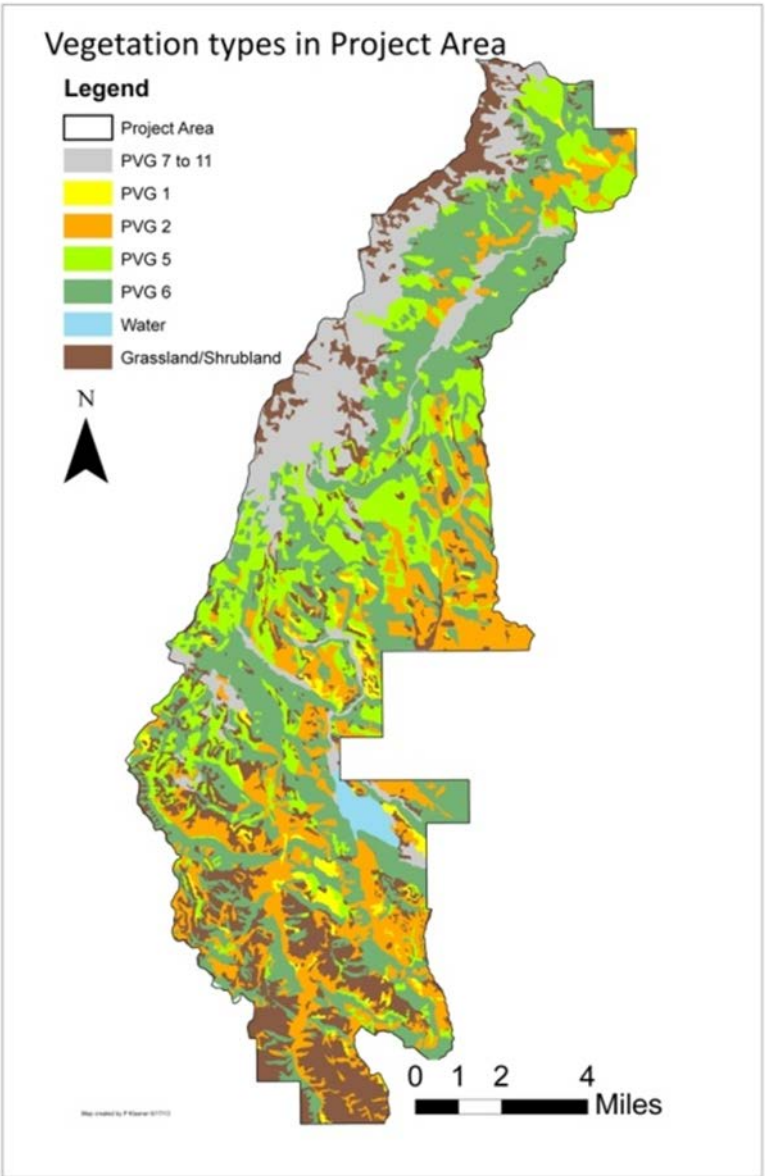


Figure FV-1. Vegetation Types in the Project Area

Current Condition

The current condition in each stand was characterized by assigning strata and working group (USDA Forest Service 2004) to describe the existing forested vegetation. Strata are groups of stands that are relatively homogeneous in age, productivity, and density (USDA Forest Service 2004), and can be used to assess landscape and stand level conditions of forested and non-forested vegetation. Strata are combined into working groups that share similar species composition and productivity. For this analysis, strata assignments were updated from the 2004 data based on changed conditions (USDA Forest Service 2011; *Crosswalk from PNF Strata Layer to Tree Size Class and Canopy Cover Class*). The strata and working group classification is a snapshot of existing vegetative conditions and accounts for past management activities (such as timber harvest) as well as for natural disturbance events (such as wildfires). The strata

and working group data was compiled for the project area and have been used to compare existing conditions to desired conditions.

Tree Size Class

Tree size class is based on the largest diameter at breast height (DBH) of trees according to the criteria in table FV-2, below. In forested habitats, if none of the definitions apply, the tree size class is considered grass/forb/shrub/seedling (GFSS). The tree size class is determined by the largest trees that meet the definition, not the most abundant. In the case of determining tree size class, the trees in the largest tree size class that contain ≥10 percent canopy cover determine the tree size class and the only canopy cover used is the cover of trees in that specific class.

Canopy cover represents the total non-overlapping cover of all trees in a stand, excluding the seedling tree size class. Trees in the seedling tree size class are used to estimate canopy cover class only when they represent the only structural layer present. Areas with less than 10 percent canopy cover are considered non-forested or in an earlier stage of succession.

Table FV-2. Tree Size Class definition

DBH (inches)	Total Non-overlapping Canopy Cover of Trees (%)	Tree Size Class
≥ 20 .0	≥ 10	Large
12.0 – 19.9	≥ 10	Medium
5.0 – 11.9	≥ 10	Small
0.1 – 4.9	≥ 10	Sapling
0	NA	GFSS[1]

1 – GFSS-Grass/Forb/Shrub/Seedling Size Class

PVGs 2, 5, and 6 are all below the desired range in the grass/forb/ shrub/seedling (GFSS) and sapling tree size classes. PVG 2 and 5 are greater than the desired ranges in the medium tree size class and less than the desired ranges in the large tree size class. PVG 6 is within the desired range for the small, medium and large tree size classes as are the small tree size class in PVG 2 and 5.

Table FV-3 displays the current condition for tree size class categories compared to the desired conditions.

Table FV-3 Tree Size Class Desired versus Existing Condition

Tree Size Class	**Acres by PVG** (percentage in parenthesis)					
	PVG 2		**PVG 5**		**PVG 6**	
	Desired	Existing	Desired	Existing	Desired	Existing
GFSS	*567-709 (4-5)*	**71 (1)**	*383-511 (3-4)*	**38 (0)**	*1,836-20,98 (7-8)*	**216 (1)**
Saplings	*425-992 (3-7)*	**64 (0)**	*383-894 (3-7)*	**47 (0)**	*1,836-2,360 (7-9)*	**231 (1)**
Small	*709-2,977 (5-21)*	2,720 (19)	*511-2,808 (4-22)*	1,240 (10)	*2,885-7,080 (11-27)*	*7,068 (27)*
Medium	*992-4,961 (7-35)*	[7,849 (55)]	*894-3830 (7-30)*	[4,492 (35)]	*4,720-9,441 (18-36)*	*8,401 (32)*
Large	*8,363-11,339 (59-80)*	**3,469 (24)**	*8,425-10,723 (66-84)*	**6,947 (54)**	*7,343-14,685 (28-56)*	*10,309 (39)*
Bold indicates a deficit, Italics is within the desired range, and brackets [] indicate an overabundance						

The abundance of medium tree size classes, as well as the deficit of the large tree size class, can be primarily attributed to past timber management within the project area. There are approximately 18,300 acres of plantations in the project area. The majority of these plantations were established from the 1960's through the early 1990's, the majority of which are currently in the small and medium tree size classes. The deficit in the GFSS and sapling size classes can be attributed to lack of natural disturbance (primarily due to fire suppression) and lack of recent regeneration treatments that attempt to mimic natural disturbance processes.

Canopy Cover Class

Canopy cover is used in two different calculations. The first is used to determine tree size class as described in the tree size class section, above. Once the tree size class is determined, canopy cover class is determined by the total non-overlapping canopy cover of all trees in a stand (except seedlings). This total non-overlapping canopy cover determines the canopy cover class assigned to each stand. Table FV-4 identifies the canopy cover class criteria utilized in this analysis.

Table FV-4. Canopy Cover Class Criteria

Canopy Cover Class	Total Non-overlapping Canopy Cover
Low	10 – 39%
Moderate	40 – 69%
High	70 % or more

The Forest Plan and draft WCS identify desired conditions for canopy cover class for stands in the large tree size class. Table FV-5 displays the current condition for canopy cover class in the large tree size class stands as compared to the desired conditions. This comparison indicates that PVG 2 is deficit in the low canopy cover class and has an overabundance of the moderate and high canopy cover classes. PVG 5 is deficit in the low and moderate canopy cover classes and has an overabundance of the high canopy cover

class. PVG 6 has an overabundance of the high canopy cover class and a deficit of the moderate canopy cover class. These conditions are a result of past management in the project area, primarily fire suppression, combined with years of tree growth, natural seedling establishment, seedling growth and a minimal amount of recent natural disturbance.

Table FV-5. Canopy Cover Class Desired Versus Existing Condition

Canopy Cover Class Desired versus Existing (Applies only to large tree size class stands)						
Canopy Cover Class	**Acres by PVG** (percentage in parenthesis)					
	PVG 2		**PVG 5**		**PVG 6**	
	Desired	Existing	Desired	Existing	Desired	Existing
Low	*2,567-3,261 (74-94)*	**304 (9)**	*1,737-3,126 (25-45)*	**893 (13)**	*0-2,062 (0-20)*	196 (2)
Moderate	*208-902 (6-26)*	[2,436 (70)]	*3,821-5,210 (55-75)*	**3,432 (49)**	*8,247-10,309 (80-100)*	**5,362 (52)**
High	*0 (0)*	[729 (21)]	*0 (0)*	[2,622 (38)]	*0 (0)*	[4,751 (46)]
Bold indicates a deficit, Italics is within the desired range, and brackets [ ] indicate an overabundance.						

Species Composition

Forest inventory data were utilized to determine the current condition for species composition (USDA Forest Service 2004a and 2004b). Species composition data for this analysis were derived from strata/working group averages. The Forest Plan specifies desired species compositions for all size classes (USDA Forest Service 2003, p. A-7) whereas the draft WCS identifies species compositions for the large tree size class only (USDA Forest Service 2011a, p. A-8).

For species composition, finer scales (such as stand level prescriptions) are not expected to mirror these desired forest-wide values because of the specific mix of habitat types present in individual areas. The proper species mix for each stand should be determined by habitat types and other concerns, such as wildlife or wildland/urban interface. This project contains fewer habitat types than are represented by each PVG, thus the forest-wide desired species composition should be viewed as a general goal. Although the desired stand level species compositions may deviate from these forest-wide desired conditions, in general, both would result in landscapes dominated by early-seral species for the PVGs and fire regimes present in the project area. These early-seral species are better adapted to site conditions and are usually more resilient to disturbances such as fire. For example, aspen is a minor component of many PVGs but because it is a trace species, forest-wide datasets do not capture its distribution and abundance well. For this reason these early-seral trace species, especially species in decline, such as aspen and western larch, should be retained where they are found on the landscape. Both of these species are found throughout the project area in varying abundance depending upon site characteristics.

The following table (see Table FV-6 below) displays the desired species composition ranges and the existing species compositions for the large tree size class and the existing species compositions for all size classes.

Table FV-6. Desired versus Existing Species Composition (%)

Species Composition - Desired vs. Existing									
Species	**PVG 2**			**PVG 5**			**PVG 6**		
	***Desired*[1]**	***Existing*** *Large Tree Size Class Only*	***Existing*** *All Size Classes*	***Desired*[1]**	***Existing*** *Large Tree Size Class Only*	***Existing*** *All Size Classes*	***Desired*[1]**	***Existing*** *Large Tree Size Class Only*	***Existing*** *All Size Classes*
Aspen	*T*	-	-	*T*	-	-	*T*	-	-
Lodgepole Pine	*T*	-	-	*T*	-	-	*1-5%*	-	-
Ponderosa Pine	*81-87%*	**53%**	**55%**	*80-88%*	**21%**	**26%**	*23-41%*	**22%**	32%
Whitebark Pine	-	-	-	-	-	-	-	-	-
Western Larch	-	-	-	*0-1%*	-	-	*15-29%*	-	-
Douglas-fir	*10-16%*	[28%]	[28%]	*7-17%*	[33%]	[32%]	*15-25%*	[32%]	[31%]
Engelmann Spruce	-	-	-	*T*	-	-	*0-2%*	-	-
Grand Fir	-	[14%]	[13%]	*0-1%*	[33%]	[30%]	*9-23%*	[33%]	[27%]
Subalpine Fir	-	-	-	-	-	-	*0-3%*	-	-
OTHER	-	*4%*	*4%*	-	*13%*	*12%*	-	*13%*	*10%*
Bold indicates a deficit, *Italics* is within the desired range, and brackets [ ] indicate an overabundance									
1 – Desired species composition conditions for all size classes (per Forest Plan) and large tree only (per draft WCS) are identical.									
T = Trace									
Existing species compositions displayed in this table are based on forest-wide data (USDA Forest Service 2004).									

As displayed above in Table FV-6:

- PVG 2 has less ponderosa pine and more Douglas-fir than desired in large tree size class stands and in all size classed stands.
- PVG 5 also has less ponderosa pine and more Douglas-fir and grand fir than desired in both large tree size class stands and in all size classed stands.
- PVG 6 has a deficit of western larch and an excess of Douglas-fir and grand fir in both the large tree size class and in all size classes combined.
- In PVG 6, ponderosa pine has a slight deficit in the large tree size class but is within the desired range when all size classes are considered.

Currently, unmanaged stands are declining in early-seral species and increasing in climax species as stands move through succession as discussed by Steele, 1985 and Crane, 1986. A comparison of Payette National Forest inventory data over time indicates that there has been a decline in early-seral species (e.g. – ponderosa pine) in unmanaged stands on the forest. This inventory data also indicates that managed (harvested) stands show little change over time in the mix of seral and climax species. Plantations in the project area have an abundance of early-seral species, due to species compositions planted after regeneration harvests. (USDA Forest Service 2002, p. 13).

These forest-wide trends are consistent with field observations in the project area that indicate an overabundance of late seral species (most notably grand fir) and a decline in the vigor of desired early-seral species in mature stands. This decline in the vigor of western larch and ponderosa pine was noted throughout the project area in many of the mature stands with mortality of the larger diameter pine, larch and Douglas-fir with western pine beetle, ips spp., Douglas-fir beetles and competition as the primary causal factors. Observations also indicate that many of the plantations are near monocultures of ponderosa pine with limited amounts of western larch and Douglas-fir also abundant in areas.

These trends in species compositions can be attributed primarily to fire suppression and past timber management which have reduced the number and frequency of surface fires and removed many of the large early-seral tree species and resulted in increased growth of shade-intolerant species such as grand fir. Historical data and forest inventory across the western United States has shown declines in early-seral tree species and increases in climax (shade tolerant) tree species (USDA Forest Service 2002; Sloan 1996; Covington and Moore 1994).

Field review of the project area indicates that western larch, aspen, ponderosa pine and Douglas-fir are all in decline in mature and overmature stands and most notably in unmanaged stands. Although the forest-wide data indicate that Douglas-fir is overabundant in PVG 6, field review indicates that competition with grand fir and Douglas-fir beetle activity in the project area are causing moderate levels of mortality, especially in large diameter Douglas-fir.

Spatial Pattern

Recent advances in theory and empirical studies of vegetation and landscape ecology indicate that to achieve long-term biological diversity across landscapes, management needs to consider the major disturbance processes, including variability and scale, that determine ecosystem components and their spatial pattern (Baker 1992; Baker and Cai 1992; Hessberg et.al. 2007; Crane and Fischer 1986). Because fire was historically a major disturbance process in the west and in the project area, (Barrett 1994; Barrett 1997; Mehl et. al. 1998; Morgan and Parsons 2001) historical fire regimes have been recommended to help set context for the individual components of the desired conditions (Wallin et.al. 1996).

The mix of historic fire regimes on the landscape help determine the appropriate patch size and arrangement. For example, portions of a landscape dominated by nonlethal fire regimes (i.e. PVG 2 and PVG 5) may be primarily large tree size class with fine-grain patches of smaller tree size class, whereas portions of a landscape dominated by mixed fire regimes (i.e. PVG 6) may have numerous small to large patches of different tree size classes. For this analysis, the amount of vegetation departure from reference conditions was calculated utilizing the process defined in the Fire Regime Condition Class (FRCC) guidebook (Hann et. al. 2004) Hann, W.; Shlisky, A.; Havlina, D.; Schon, K.; Barrett, S.; DeMeo, T.; Pohl, K.; Menakis, J.; Hamilton, D.; Jones, J.; Levesque, M.; Frame, C. 2010. Interagency Fire Regime Condition Class Guidebook. Last update September 2010: Version 3.0, USDA Forest Service, US Department of the Interior, The Nature Conservancy, and Systems for Environmental Management. Available: www.frcc.gov. This departure is calculated by: 1) determining the abundance (in percent) of each successional class (either existing or projected); 2) identifying the amount of similarity (in percent) the existing conditions have to the reference conditions; and 3) adding the cumulative similarity and subtracting that value from 100 percent. The resulting value is the amount of vegetation departure the landscape has or is projected to have. Strata data were utilized to compare existing conditions to the desired reference conditions. The

desired reference conditions were adapted from the Forest Plan appendix A and Morgan and Parsons (2001) documentation of the historic range of variability.

Table FV-7. Reference Conditions and Existing Distribution of Successional Classes

Reference Conditions and Existing Distribution of Successional Classes								
These Reference Conditions are based upon Desired Conditions documented in the Forest Plan Appendix A and Morgan and Parson (2001). Midpoint values were used.								
This chart summarizes the Desired Conditions outlined in the Forest Plan for PVGs in all MPCs except for 5.2. DFCs are based upon HRV from Morgan and Parson (2001)								
Existing condition is in italicized font.								
Potential Vegetation Group (PVG)[1]		**Early Seral[1]**	**Mid Seral Closed[1]**	**Mid Seral Open[1]**	**Late Seral Open[1]**	**Late Seral Closed[1]**	**Uncharacteristic[3]**	**Overall Vegetation Departure**
2 - Warm, Dry Douglas-fir / Moist Ponderosa Pine	Desired	6%	3%	14%	65%	12%	0%	68%
	Existing	***1%***	***26%***	***29%***	***2%***	***17%***	***24%***	
5 - Dry Grand Fir	Desired	5%	12%	6%	27%	50%	0%	47%
	Existing	***1%***	***14%***	***21%***	***7%***	***27%***	***30%***	
6 - Moist Grand Fir	Desired	8%	24%	3%	7%	58%	0%	51%
	Existing	***2%***	***23%***	***9%***	***1%***	***20%***	***45%***	
Vegetation Departure Summary Rating[4]	***N/A***							***55%***
1 - Based on Appendix A of the Forest Plan LRMP (2003) and Morgan and Parsons (2001)								
2 - CC=Canopy Closure. This is based upon table A-5 in the Payette NF-LRMP Appendix A.								
3 – Uncharacteristic is defined as high canopy cover stands (canopy cover >69%) as defined by Morgan and Parsons (2001).								
4 – the Vegetation Departure Summary Rating is determined by taking the weighted average (of acres) by the Overall Vegetation Departure by PVG.								

The current spatial patterns in the analysis area can be described by stand structures percentages throughout the landscape. Currently, the project area is 55 percent departed from vegetative reference conditions with PVG 2 being 68 percent departed, PVG5 being 47 percent departed and PVG 6 being 51 percent departed from the proportion of historic successional classes as interpreted from the Forest Plan and Morgan and Parsons (2001).

3.1.4 Direct and Indirect Effects

The effects of the alternatives on forested vegetation are measured by how each alternative would change the current condition in comparison to the desired conditions for tree size class, canopy cover class, species composition and spatial pattern.

To evaluate the direct and indirect effects of the alternatives on the forested vegetation, strata and working group data was utilized to develop quantitative estimates for the current and short term (immediate after treatment) effect. For longer term estimates, qualitative descriptors and applicable research was utilized to describe effects of treatments.

Tree Size Class

Table FV-3, above, compares the existing distribution of tree size classes by PVG to the desired conditions. Table FV-8, below, identifies the number of acres that would be treated to maintain or promote the large tree size class by alternative. The effects of each alternative on the percentage of area in each tree size class are discussed below.

Large Tree Size Class Indicator/Measurement

Table FV-8 displays the amount of acres treated to maintain (existing large tree size class stands) and promote (existing medium tree size class stands) large tree size class stands. This indicator/measurement was selected because there is currently a deficit of large tree size class stands in PVGs 2 and 5 (see table FV-3, above) and PVG 6 is in the lower half of the desired range for the large tree size class. By maintaining existing large tree stands in that size class and enhancing the resiliency and resistance of the stands to disturbance that could move the stands out of the large tree size class and by promoting the development of medium tree size class stands into the large tree size class with desired characteristics (e.g., canopy cover and species compositions) management actions would move toward the desired conditions specified in the Forest Plan.

Alternative A

Alternative A would not treat any stands to maintain the resiliency and resistance of large tree size class. Nor would alternative A treat stands to promote the development of medium tree size class stands into the large tree size class. Although many of the medium tree size class stands would be anticipated to develop into the large tree size class over the next 10 to 30 years and large tree size class stands are anticipated to remain in that class, current stand densities and species compositions make many of these stands susceptible to mortality of desired large diameter trees from insects (i.e., western pine beetle, ips *spp*., Douglas-fir beetle) and/or wildfire.

All Action Alternatives

All of the action alternatives are designed to maintain large tree size class stands by managing densities to enhance the resiliency and resistance of the stands to disturbance events such as wildfire and insects. These alternatives would also promote the development of medium tree size class stands by promoting the growth of desired trees to accelerate development of the large tree size class with desired tree species compositions. Alternative D would treat the most acres to both maintain and promote the large tree size class, whereas Alternative C would treat the fewest acres. See Table FV-8, below, for a comparison of acres treated by alternative.

Table FV-8. Acres treated to maintain and promote large tree size class by alternative

Acres treated to maintain and promote large tree size class by alternative					
	Alternative				
	A	B	C	D	E
Acres treated[1] to maintain	0	8,795	5,199	9,937	9,049
Acres treated[2] to promote	0	6,360	4,852	6,468	5,242

1 – Includes density reduction treatments in existing Large Tree Size Class Stands (includes targeted prescribed burning, NCT, CT/FT, CT/MP, and free thin portion of the FT/PC treatment) see glossary for definitions of acronyms.

Regeneration treatments (patch cuts and shelterwoods) have not been included in these acres although these treatments would maintain these stands in the large tree size class as they are designed with the intent to improve species composition and have been designed to maintain the large tree size class for the foreseeable future (50-100 years)

2 – Includes density reduction treatments in existing Medium Tree Size Class Stands (includes targeted prescribed burning, NCT, CT/FT, and CT/MP treatments)

1 & 2 – Prescribed burning and NCT treatment acres have not been included, as these treatments have been designed specifically to improve the resiliency of the stands. Although these treatments may aid in in promoting growth by reducing densities they can also have detrimental effects on the large tree size class through mortality of large trees and reducing growth for a period of time post treatment.

Treatments in small tree size class stands and smaller have not been included in these acres as they are not anticipated to contribute to the large tree size class within the next 20 to 30 years. Although, these treatments would improve growth rates in treated stands which would aid in promoting the large tree size class in the long term (greater than 30-50 years).

Effects Common to all Action Alternatives

There would be no immediate post treatment effect to tree size class distribution from the treatments in any of the alternatives. No large tree size class stands would be moved to a smaller size class in any of the alternatives. For example, in a large tree stand that is proposed for prescribed fire only treatment, and is on the cusp of having enough canopy cover of trees greater than 20 inches in diameter, silvicultural prescriptions and burn plans would be limited to ensure that the stand would not be reduced to a smaller size class. All vegetative treatments, including mechanical and prescribed fire, would retain stands in their existing tree size class.

None of the alternatives would move toward the desired GFSS and sapling tree size class objectives. Although regeneration treatments have been proposed in Alternatives B, D and E these treatments would retain too much canopy cover in the large and medium trees to qualify as GFSS stands. The regeneration treatments proposed have been designed to retain clumps of untreated areas within each unit as well as to retain biological legacies such as legacy trees, snags, and coarse woody debris to maintain structure and ecological processes identified in the science in the draft WCS (Franklin et. al. 2008; USDA Forest Service 1997). The proposed regeneration treatments attempt to mimic a disturbance of moderate severity with a mosaic created within the proposed regenerated stands.

Alternative A

Current tree size class distributions are displayed in table FV-3, above. Under Alternative A, movement toward the desired conditions for tree size class would be at a slower rate than any of the action alternatives. Tree size class percentages would change slowly over time as growth occurs and some tree size classes would develop into the next size larger class while others would fall into the lower size class due to natural disturbance events (e.g. - insects and wildfire). In addition, at current stand densities, many

of the dense stands would have high susceptibility to insect attacks which could affect the tree size class in some of these stands.

Of the 18,300 acres of plantations, approximately forty-two percent are estimated to have high densities and many of the less dense plantations have patches throughout that are quite dense. Under this alternative, many of these dense plantations would be susceptible to western pine beetle infestations. Western pine beetle activity was documented in a number of these plantations during field reconnaissance. Many of these plantations are currently in or entering the size class and density ranges where susceptibility to western pine beetle is anticipated to increase (Jorgenson et. al. 2013). These dense plantations would also be susceptible to density induced growth rate reductions that, once the reduction occurs, the trees are not anticipated to return to the higher diameter growth rates (Basford et. al. 1991) which would further slow the development of these stands into larger tree size classes.

Mature stands in the grand fir forest types (PVG 5 and 6), especially in the northern portion of the project area, have seen recent intensification of Douglas-fir beetle and western spruce budworm activity; whereas the southern portion of the project area has recently seen an increase in western pine beetle and ips beetle activity (USDA FHP 2008, 2009, 2010, 2011, 2012). Under the No Action alternative, the dense conditions in many of these mature stands will lead to higher susceptibility to Douglas-fir beetle, western pine beetle, and western spruce budworm as defined by Jorgenson and others (2013).

In summary, in many of the moderate and high canopy closure stands, Alternative A would cause the rate at which stands develop into the next larger tree size class to be slower than if density management actions (such as thinning) were completed. Slower growth is expected in these stands due to relatively high stand densities which result in competition for growing space, water, nutrients and sunlight.

Alternative B

This alternative proposes five types of treatments that could affect tree size class and growth of stands into the next larger size class: non-commercial thinning (NCT), commercial thin-mature plantation (CT/MP), commercial thin-free thin (CT/FT), free thin-patch cut (FT/PC), and prescribed burn treatments. These treatments could affect tree size class and growth by direct mortality and/or removal of trees and based on the effects of treatments on growth of individual trees.

Non-commercial thinning (NCT) outside of harvest units could occur on up to 18,000 acres in both mature forests and plantations. The commercial thin-mature plantation (CT/MP) treatment would occur on up to 8,100 acres. The commercial thin-free thin (CT/FT) treatment would occur on up to 12,200 acres. All of these treatments would promote growth of residual trees by removing shade tolerant species, increasing available growing space, and reducing competition for moisture, sunlight and nutrients (Oliver and Larson 1996; Cochran and Barrett 1993; Cochran and Barrett 1999a; Cochran and Barrett 1999b; Basford et. al. 1991; Fiedler et.al. 2010). These treatments would reduce tree densities and promote maintenance and development of early-seral, large and legacy trees.

The free thin-patch cut (FT/PC) treatment would occur on up to 1,800 acres. In portions of these FT/PC units that receive free thin treatments, effects would be similar to those described for CT/FT treatments, above. In areas that receive the patch cut treatment, four to twelve of the larger diameter trees per acre would be retained. Overall, the FT/PC treatment would maintain the large tree size class by leaving the larger, more fire resistant ponderosa pine, Douglas-fir and western larch and if available, typically retain at least 20 to 25 percent canopy cover in the stand as a whole.

In the mid-term (5 to 30 years), these NCT and free thin treatments are anticipated to increase the rate of diameter growth (Basford et. al 1991; Cochran and Barrett 1999a; Cochran and Barrett 1999b) which would aid in moving the treated medium tree size stands (approximately 5,950 acres) toward the large tree size class and maintain existing large tree stands in that tree size class.

The proposed burns would be low intensity ground fires that are not anticipated to reduce the tree size class as larger diameter trees are generally more resistant to mortality than the smaller diameter trees in a stand, primarily due to thicker bark. Although some mortality of large diameter trees (including some legacy trees) is anticipated, past experience and monitoring indicate that prescribed burning typically kills less than five percent of the largest tree size class trees in a stand. In stands that will be mechanically treated prior to burning, additional trees would be retained or timing of the burn would be altered to account for this mortality and aid in meeting treatment objectives.

In summary, the immediate effect of all vegetative treatments (NCT, CT/MP, CT/FT, FT/PC and prescribed burning) would be to retain stands in their current size class. In the mid-term, the NCT, CT/MP, CT/FT and free thin portions of FT/PC stands would promote the growth of residual trees. This expedited growth would accelerate movement of GFSS, sapling, small and medium tree size class stands into the next larger tree size class.

Table FV-9, displays acres treated by PVG and tree size class for Alternative B. Alternative B would commercially treat 6,400 acres of small tree size class, 6,000 acres of medium tree size class, and 9,650 acres of large tree stands.

Table FV-9. Alternative B – Acres of Treatment Type by PVG and Tree Size Class

Tree Size Class	**Treatment Type**					
	CT/FT		**CT/MP**			**FT/PC**
	Medium Tree	*Large Tree*	*Small Tree*	*Medium Tree*	*Large Tree*	*Large Tree*
PVG 1	*50*	*150*	*50*	*100*	*0*	*0*
PVG 2	*2,250*	*2,100*	*1,350*	*300*	*0*	*0*
PVG 5	*1,250*	*3,650*	*750*	*450*	*0*	*0*
PVG 6	*800*	*1,900*	*4,300*	*750*	*50*	*1,800*
Total	**4,400**	**7,800**	**6,400**	**1,600**	**50**	***1,800***
Discrepancies in acreages are attributable to rounding						

Alternative C

This alternative proposes four types of treatments that could affect tree size class and growth of stands into the next larger size class: non-commercial thinning (NCT), commercial thin-mature plantation (CT/MP), commercial thin-free thin (CT/FT), and prescribed burn treatments. These treatments could affect tree size class and growth by direct mortality and/or removal of trees and based on the effects of treatments on growth of individual trees.

Non-commercial thinning (NCT) outside of harvest units could occur on up to 22,000 acres in both mature forests and plantations. The commercial thin-mature plantation (CT/MP) treatment would occur on up to 6,000 acres. The commercial thin-free thin (CT/FT) treatment would occur on up to 8,500 acres. All of these treatments would promote growth of residual trees by removing shade tolerant species, increasing available growing space, and reducing competition for moisture, sunlight and nutrients (Oliver and Larson 1996; Cochran and Barrett 1993; Cochran and Barrett 1999a; Cochran and Barrett 1999b; Basford et. al. 1991; Fiedler et.al. 2010). These treatments would reduce tree densities and promote maintenance and development of early-seral, large and legacy trees.

In the mid-term (5 to 30 years), these NCT and free thin treatments are anticipated to increase the rate of diameter growth (Basford et. al 1991; Cochran and Barrett 1999a; Cochran and Barrett 1999b) which would aid in moving the treated medium tree size stands (approximately 4,500 acres) toward the large tree size class and maintain existing large tree stands in that tree size class.

The proposed burns would be low intensity ground fires that are not anticipated to reduce the tree size class as larger diameter trees are generally more resistant to mortality than the smaller diameter trees in a stand, primarily due to thicker bark. Although some mortality of large diameter trees (including some legacy trees) is anticipated, past experience and monitoring indicate that prescribed burning typically kills less than five percent of the largest tree size class trees in a stand. In stands that will be mechanically treated prior to burning, additional trees would be retained or timing of the burn would be altered to account for this mortality and aid in meeting treatment objectives.

The effects of Alternative C on tree size class would be similar to those described for Alternative B except that: 1) treatments would leave higher residual stand densities (e.g. CT/FT post treatment canopy cover would be between 25 and 45 percent) and 2) less acres would be considered for treatment than in any of the other action alternatives.

The result of these differences is that stand growth in treated stands would be affected (improved) for a shorter period of time before competition would begin (Long and Shaw 2005; Long and Shaw 2012; Shaw and Long 2010). In addition, density levels would leave some stands (especially those left in the moderate canopy cover class) more susceptible to insects which in the case of western pine beetle and Douglas-fir beetle could affect the number of large early-seral trees per acre. The greater amount of untreated stands and higher densities within treated stands would make the landscape more susceptible to spruce budworm, which would cause diameter growth of individual trees to decrease if the current outbreak were to worsen in the project area.

Diameter growth would decrease as treatment intensity decreases (Cochran and Barrett 1999a; Cochran and Barrett 1999b). Therefore, the mid to long term benefits on tree size class from individual tree growth would be less pronounced in this alternative than in any of the other action alternatives, especially in large tree stands retained in the moderate and high canopy cover classes. In the existing medium tree size class

stands, this reduced diameter growth in comparison to the other action alternatives would result in slower development to the large tree size class across the landscape.

The combination of less intensive treatments with fewer acres proposed for treatment makes Alternative C the least beneficial action alternative for tree size class in the mid to long term when compared to other action alternatives. This alternative would also leave portions of the project area more susceptible, less resistant and less resilient to insects, and less resilient to wildfire than any of the other action alternatives. This could lead to undesirable effects on tree size class objectives especially in light of climate change and associated predictions regarding wildfire and insects (Klienjunas 2011; National Resource Council 2011).

Table FV-10, displays commercially treated acres by tree size class by PVG for alternative C. Alternative C would commercially treat 4,850 acres of small tree size class, 4,500 acres of medium tree size class, and 5,100 acres of large tree stands.

Table FV-10. Alternative C – Acres of Treatment Type by PVG and Tree Size Class

Tree Size Class	**Treatment Type**				
	CT/FT			**CT/MP**	
	Small Tree	*Medium Tree*	*Large Tree*	*Small Tree*	*Medium Tree*
PVG 1	*0*	*50*	*125*	*50*	*75*
PVG 2	*25*	*2,000*	*1,650*	*1,200*	*150*
PVG 5	*25*	*1,100*	*2,900*	*600*	*400*
PVG 6	*0*	*150*	*400*	*2,950*	*600*
Total	**50**	**3,300**	**5,100**	**4,800**	**1,200**
Discrepancies in acreages are attributable to rounding					

Alternative D

This alternative proposes five types of treatments that could affect tree size class and growth of stands into the next larger size class: non-commercial thinning (NCT), commercial thin-mature plantation (CT/MP), commercial thin-free thin (CT/FT), shelterwood with reserves, and prescribed burn treatments. These treatments could affect tree size class and growth by direct mortality and/or removal of trees and based on the effects of treatments on growth of individual trees.

Non-commercial thinning (NCT) outside of harvest units could occur on up to 18,000 acres in both mature forests and plantations. The commercial thin-mature plantation (CT/MP) treatment would occur on up to 8,100 acres. The commercial thin-free thin (CT/FT) treatment would occur on up to 14,500 acres. All of these treatments would promote growth of residual trees by removing shade tolerant species, increasing available growing space, and reducing competition for moisture, sunlight and nutrients (Oliver and Larson 1996; Cochran and Barrett 1993; Cochran and Barrett 1999a; Cochran and Barrett 1999b; Basford et. al. 1991; Fiedler et.al. 2010). These treatments would reduce tree densities and promote maintenance and development of early-seral, large and legacy trees.

In the mid-term (5 to 30 years), these NCT and free thin treatments are anticipated to increase the rate of diameter growth (Basford et. al 1991; Cochran and Barrett 1999a; Cochran and Barrett 1999b) which would aid in moving the treated medium tree size stands (approximately 6,100 acres) toward the large tree size class and maintain existing large tree stands in that tree size class.

The shelterwood with reserves treatment would occur on up to 2,600 acres. In areas that are regenerated, eight to twelve of the larger diameter trees per acre would be retained, with 5-10 percent of each stand retained in untreated reserve areas. Overall, the shelterwood treatment would maintain the large tree size class by leaving the larger, more fire resistant ponderosa pine, Douglas-fir and western larch and if available, typically retaining at least 15 to 20 percent canopy cover in the stand as a whole.

The proposed burns would be low intensity ground fires that are not anticipated to reduce the tree size class as larger diameter trees are generally more resistant to mortality than the smaller diameter trees in a stand, primarily due to thicker bark. Although some mortality of large diameter trees (including some legacy trees) is anticipated, past experience and monitoring indicate that prescribed burning typically kills less than five percent of the largest tree size class trees in a stand. In stands that will be mechanically treated prior to burning, additional trees would be retained or timing of the burn would be altered to account for this mortality and aid in meeting treatment objectives.

Alternative D includes the most intensive treatments (e.g. – CT/FT post treatment canopy cover would be between 20 and 35 percent, regeneration treatments would utilize a shelterwood with reserves system) and would consider the largest amount of acres for mechanical treatment.

The effect of this alternative on tree size class is expected to be similar to those described in Alternative B except that there would be slightly longer benefits to tree growth due to reduced competition and more acres would be affected.

Table FV-11displays acres treated by tree size class by PVG for alternative D. Alternative D would commercially treat 6,425 acres of small tree size class, 6,100 acres of medium tree size class, and 12,550 acres of large tree stands.

Table FV-11. Alternative D – Acres of Treatment Type by PVG and Tree Size Class

Tree Size Class	**Treatment Type**					
	CT/FT		**CT/MP**			**Shelterwood**
	Medium Tree	*Large Tree*	*Small Tree*	*Medium Tree*	*Large Tree*	*Large Tree*
PVG 1	*50*	*350*	*50*	*75*	*0*	*0*
PVG 2	*2,400*	*2,350*	*1,350*	*300*	*0*	*0*
PVG 5	*1,250*	*4,350*	*750*	*450*	*0*	*0*
PVG 6	*800*	*2,800*	*4,300*	*800*	*50*	*2,600*
Total	***4,500***	***9,900***	***6,450***	***1,600***	***50***	***2,600***
Discrepancies in acreages are attributable to rounding						

Alternative E

This alternative proposes five types of treatments that could affect tree size class and growth of stands into the next larger size class: non-commercial thinning (NCT), commercial thin-mature plantation (CT/MP), commercial thin-free thin (CT/FT), shelterwood with reserves, and prescribed burn treatments. These treatments could affect tree size class and growth by direct mortality and/or removal of trees and based on the effects of treatments on growth of individual trees.

Non-commercial thinning (NCT) outside of harvest units could occur on up to 12,000 acres in both mature forests and plantations. The commercial thin-mature plantation (CT/MP) treatment would occur on up to

5,400 acres. The commercial thin-free thin (CT/FT) treatment would occur on up to 13,200 acres. All of these treatments would promote growth of residual trees by removing shade tolerant species, increasing available growing space, and reducing competition for moisture, sunlight and nutrients (Oliver and Larson 1996; Cochran and Barrett 1993; Cochran and Barrett 1999a; Cochran and Barrett 1999b; Basford et. al. 1991; Fiedler et.al. 2010). These treatments would reduce tree densities and promote maintenance and development of early-seral, large and legacy trees.

In the mid-term (5 to 30 years), these NCT and free thin treatments are anticipated to increase the rate of diameter growth (Basford et. al 1991; Cochran and Barrett 1999a; Cochran and Barrett 1999b) which would aid in moving the treated medium tree size stands (approximately 5,100 acres) toward the large tree size class and maintain existing large tree stands in that tree size class.

The shelterwood with reserves treatment would occur on up to 1,900 acres. In areas that are regenerated, eight to twelve of the larger diameter trees per acre would be retained, with 5-10 percent of each stand retained in untreated reserve areas. Overall, the shelterwood treatment would maintain the large tree size class by leaving the larger, more fire resistant ponderosa pine, Douglas-fir and western larch and if available, typically retaining at least 15 to 20 percent canopy cover in the stand as a whole.

The proposed burns would be low intensity ground fires that are not anticipated to reduce the tree size class as larger diameter trees are generally more resistant to mortality than the smaller diameter trees in a stand, primarily due to thicker bark. Although some mortality of large diameter trees (including some legacy trees) is anticipated, past experience and monitoring indicate that prescribed burning typically kills less than five percent of the largest tree size class trees in a stand. In stands that will be mechanically treated prior to burning, additional trees would be retained or timing of the burn would be altered to account for this mortality and aid in meeting treatment objectives.

Alternative E includes the most intensive treatments (e.g. – CT/FT post treatment canopy cover would be between 20 and 35 percent, regeneration treatments would utilize a shelterwood with reserves system) and would consider the largest amount of acres for mechanical treatment.

The effect of this alternative on tree size class is expected to be similar to those described in Alternative B except that there would be slightly longer benefits to tree growth due to reduced competition and more acres would be affected.

Alternative E would commercially treat 4,500 acres of small tree size class, 5,100 acres of medium tree size class, and 10,900 acres of large tree stands.

Table FV-12. Alternative E – Acres of Treatment Type by PVG and Tree Size Class

Tree Size Class	**Treatment Type**					
	CT/FT		**CT/MP**			**Shelterwood**
	Medium Tree	*Large Tree*	*Small Tree*	*Medium Tree*	*Large Tree*	*Large Tree*
PVG 1	*50*	*300*	*10*	*15*	*0*	*0*
PVG 2	*2,150*	*2,050*	*800*	*150*	*0*	*0*
PVG 5	*1,250*	*4,150*	*450*	*350*	*0*	*0*
PVG 6	*750*	*2,450*	*3,200*	*400*	*25*	*1,900*
Total	**4,200**	**9,000**	**4,500**	**900**	**25**	**1,900**
Discrepancies in acreages are attributable to rounding						

Summary of Tree Size Class

Alternative A would move toward the desired distributions of the small, medium and large tree size classes in the mid- to long term but at a slower rate than any of the action alternatives. In addition the landscape would be less resilient to disturbance from wildfire and more susceptible, resistant and resilient to disturbance from insects such as western spruce budworm, Douglas-fir beetle, and western pine beetle which could have undesired effects on the tree size class objectives.

All alternatives would move medium tree size class stands toward the large tree size class with Alternatives B and D treating the most acres.

All alternatives would retain acres in the large tree size class with alternative B and D treating the most acres to maintain resilient stand conditions.

Alternative B would treat fewer acres commercially than Alternatives D but more than E and the treatments would be less intensive.

Alternative C would treat the fewest acres commercially and proposes the least intensive treatments of any of the action alternatives. Therefore the benefits of increased tree growth and duration of benefits on treated acres would be less than any of the other action alternatives but would still be more beneficial to individual tree growth than Alternative A. Alternative C would allow for more non-commercial treatments than any other alternative and the same prescribed fire treatments as Alternatives B and D and would therefore create more resilient landscape than Alternative E.

Alternative D would have the greatest effect on moving stands toward the large tree size class because it would treat more acres more intensively than the other alternatives which would reduce competition and increase growth rates of residual trees.

Alternative E would also have the greatest longevity of benefits on tree growth but proposes to treat less acres and would therefore be slightly less effective at moving stands toward the large tree size class in the mid to long term. In addition this alternative would not create as resilient of stand conditions due to the reduction in acres of non-commercial and prescribed burning treatments. This would leave more acres at higher risk of crown fire which could adversely affect tree size class.

Canopy Cover Class

Canopy cover class would be affected by all of the alternatives. Desired conditions and current conditions for canopy cover class are displayed by PVG in Table FV-5. Desired conditions for canopy cover class apply only to stands in the large tree size class.

Alternative A

The immediate effect of Alternative A would be that stands would remain in their current canopy cover class (See table FV-5, above). No acres would move toward desired conditions for canopy cover. In the mid-term (5-30 years) increased tree densities from natural regeneration and growth of crown diameters in the more vigorous trees would cause stands with low and moderate canopy cover to eventually become stands with moderate and high canopy cover, moving further from the desired condition.

The immediate post treatment effects to canopy cover in PVG 2, would be a continued excess of high and moderate canopy cover classes and a deficit of the low canopy cover class. In PVG 5, there would continue to be an excess of high canopy cover class and a continued deficit in the low and moderate canopy cover

classes. In PVG 6, there would continue to be an excess of the high canopy cover class, a deficit of the moderate canopy cover class and the low canopy cover class would remain at the bottom end of the desired range.

Over time, stand densities would continue to increase moving further from the desired conditions. As less light reaches the forest floor, favoring shade-tolerant species, there is an increased potential for disturbance events such as uncharacteristic wildfire and insect outbreaks. This alternative increases the likelihood of continued departures from desired vegetative conditions, and if continued over the long term, would create conditions that would be difficult to restore to the desired conditions.

Alternative B

The effect of the treatments proposed in Alternative B (mechanical vegetative treatments and prescribed burning) on canopy cover class are shown in table FV-13, below.

Table FV-13. Alternative B: Canopy Cover Class Effects

Alternative B: Canopy Cover Class Effects (Applies only to large tree size class stands)									
Canopy Cover Class	**Acres by PVG** (percentage in parenthesis)								
	PVG 2			**PVG 5**			**PVG 6**		
	Desired	*Existing*	*Post Treat*	*Desired*	*Existing*	*Post Treat*	*Desired*	*Existing*	*Post Treat*
Low	*2,567-3,261 (74-94)*	**304 (9)**	**2,112 (61)**	*1,737-3,126 (25-45)*	**893 (13)**	2,978 (43)	*0-2,062 (0-20)*	*196 (2)*	**[3,249 (32)]**
Moderate	*208-902 (6-26)*	[2,436 (70)]	***913 (26)***	*3,821-5,210 (55-75)*	**3,432 (49)**	***2,974 (43)***	*8,247-10,309 (80-100)*	**5,362 (52)**	***3,988 (39)***
High	*0 (0)*	[729 (21)]	[444 (13)]	*0 (0)*	[2,622 (38)]	[995 (14)]	*0 (0)*	[4,751 (46)]	**[3,072 (30)]**
Bold indicates a deficit, *black* is within the desired range, and brackets [ ] indicate an overabundance									
This table displays immediate post treatment effects									

The immediate post treatment effect of Alternative B in PVG 2 would be a reduction in acres of the moderate and high canopy cover classes and an increase in acres of the low canopy cover class, moving canopy cover toward the desired conditions. In PVG 5, there would be less acres of the moderate and high canopy cover class and the low canopy cover class would move to the high end of the desired range for low canopy cover class, which moves closer to the desired canopy cover conditions. In PVG 6, there would be a reduction of acres of the moderate and high canopy cover classes and an excess of the low canopy cover class would be created.

The overabundance of the low canopy cover class in PVG 6 is anticipated to be relatively short lived as much of the treatment proposed in PVG 6 would leave stand canopy cover toward the high end of the low canopy cover class (e.g. much of the CT/FT treatment would retain greater than 30 percent canopy cover). In the mid-term (5 to10 years post treatment) many stands in the low canopy cover class are anticipated to move into the moderate canopy cover class. Residual tree crowns and natural regeneration are projected to add 1 to 2 percent of canopy cover per year in thinned stands.

In units where canopy cover is reduced below 30 percent (e.g. – PC/FT units would be reduced to approximately 20 to 30 percent canopy cover in PVG 2, especially in NIDGS emphasis areas) canopy cover

is expected to remain in the low canopy cover class for greater than 15-20 years, especially where prescribed fire is proposed to maintain desired conditions.

Portions of large tree size class stands in PVG 2, 5 and 6 that would remain in the high canopy cover class have been deferred from treatment for various reasons including: IRA/RNA management objectives, RCA protection, stands that would be best suited to regeneration treatment but have conflicting management area direction (for example, no regeneration treatments per Forest Plan standard 0457 and 0509 [USDA Forest Service 2003, pgs. III-150 and III-159]), wildlife concerns (primarily northern goshawk nest stands), inaccessibility, and non-federal land ownership.

Alternative C

Alternative C would retain the greatest amount of moderate and high canopy cover of any of the action alternatives in all PVGs. See table FV-14, below.

Table FV-14 . Alternative C: Canopy Cover Class Effects

Alternative C: Canopy Cover Class Effects (Applies only to large tree size class stands)									
Canopy Cover Class	**Acres by PVG** (percentage in parenthesis)								
	PVG 2			**PVG 5**			**PVG 6**		
	Desired	*Existing*	*Post Treat*	*Desired*	*Existing*	*Post Treat*	*Desired*	*Existing*	*Post Treat*
Low	*2,567-3,261 (74-94)*	**304 (9)**	1,917 (55)	*1,737-3,126 (25-45)*	**893 (13)**	1,197 (17)	*0-2,062 (0-20)*	*196 (2)*	*411 (4)*
Moderate	*208-902 (6-26)*	[2,436 (70)]	[946 (27)]	*3,821-5,210 (55-75)*	**3,432 (49)**	4,164 (60)	*8,247-10,309 (80-100)*	**5,362 (52)**	**5,371 (52)**
High	*0 (0)*	[729 (21)]	[606 (17)]	*0 (0)*	[2,622 (38)]	[1,586 (23)]	0 (0)	[4,751 (46)]	[4,527 (44)]
Bold indicates a deficit, *black* is within the desired range, and brackets [ ] indicate an overabundance									
This table displays immediate post treatment effects									

The immediate post treatment effect of Alternative C in PVG 2 would be less acres of the high and moderate canopy cover classes and more acres of the low canopy cover class, moving closer to the desired conditions. In PVG 5, there would be a reduction in acres of the high canopy cover class, the moderate canopy cover class would be within desired conditions and there would be more acres in the low canopy cover class, which moves closer to the desired conditions. In PVG 6, there would continue to be an excess in acres of high canopy cover class, there would be essentially no change in the moderate canopy cover class, and the low canopy cover class would remain on the low end of the desired range, resulting in very little movement toward the desired conditions for all classes.

Overall, this alternative results in the least movement of any of the action alternatives toward desired canopy cover conditions both immediately post treatment and in the mid-term (5-30 years), especially in PVGs 5 and 6. This lesser achievement of desired canopy cover conditions is due to less acres proposed for treatment and lower treatment intensities (i.e., more canopy cover would be retained after mechanical vegetative and prescribed fire treatments are completed) than in the other action alternatives.

Portions of large tree size class stands in PVG 2, 5 and 6 that would remain in the high canopy cover class have been deferred from treatment due to public comments regarding retention of habitat for species that utilize dense forest habitat types (e.g. elk security, northern goshawk nest stands, pileated woodpeckers),

RCA protection, stands that would be best suited to regeneration treatment, IRA/RNA management objectives, inaccessibility, and non-federal land ownership.

Alternative D

Alternative D proposes the most intensive vegetation treatments and would result in the most movement toward the desired conditions for canopy cover class. In the short term (5-10 years) this alternative would result in an overabundance of the low canopy cover class in PVGs 5 and 6. Many of the low canopy cover class stands would move into the moderate canopy cover class within 5 to 10 years and result in conditions closest to the desired conditions at that point in time. See table FV-15, below.

Table FV-15. Alternative D: Canopy Cover Class Effects

Alternative D: Canopy Cover Class Effects (Applies only to large tree size class stands)									
Canopy Cover Class	**Acres by PVG** (percentage in parenthesis)								
	PVG 2			**PVG 5**			**PVG 6**		
	Desired	*Existing*	*Post Treat*	*Desired*	*Existing*	*Post Treat*	*Desired*	*Existing*	*Post Treat*
Low	*2,567-3,261* *(74-94)*	**304** **(9)**	**2,153** **(62)**	*1,737-3,126* *(25-45)*	**893** **(13)**	**4,062** (58)	*0-2,062* *(0-20)*	*196* *(2)*	[5,298 (51)]
Moderate	*208-902* *(6-26)*	[2,436 (70)]	932 (27)	*3,821-5,210* *(55-75)*	**3,432** **(49)**	**1,890** **(27)**	*8,247-10,309* *(80-100)*	**5,362** **(52)**	**2,628** **(25)**
High	*0* *(0)*	[729 (21)]	385 (11)	*0* *(0)*	[2,622 (38)]	[995 (14)]	*0* *(0)*	[4,751 (46)]	[2,383 (23)]
Bold indicates a deficit, *italics* is within the desired range, and brackets [ ] indicate an overabundance									
This table displays immediate post treatment effects									

The immediate post treatment effect of Alternative D in PVG 2 would be a reduction in acres of the moderate and high canopy cover classes and more acres in the low canopy cover class would be created, which moves toward the desired conditions. In PVG 5, there would be less acres in the moderate canopy cover class, moving away from the desired conditions; less acres in the high canopy cover class moving toward desired conditions; and more acres in the low canopy cover class creating an excess of this class. would be created. In PVG 6, there would be less acres of the moderate canopy cover class, moving further from the desired conditions; less acres in the high canopy cover class would move toward the desired conditions; and an excess of acres in the low canopy cover class would be created.

Alternative D would have similar effects to Alternative B in PVG 2 except that the intensity of the treatments would be slightly greater (e.g. – CT/FT treatments would retain approximately 5 to 10 percent less canopy cover than Alternative B in PVG 2). This would result in stands staying in the low canopy cover class for approximately 5 to 10 years longer than the other action alternatives, depending upon diameter growth of residual tree crowns and natural regeneration. This would aid in these treatments achieving the desired canopy cover conditions for a longer period of time than the other action alternatives.

In PVG 5 and 6, Alternative D would create an overabundance of the low canopy cover class immediately after treatment, due to less canopy cover being retained after mechanical and prescribed fire treatments are completed (canopy cover would be reduced to 30-35 percent in CT/FT stands in these PVGs). Although the immediate post treatment effect would be a slight improvement toward desired conditions for canopy cover, the landscape would move closer to the desired condition for canopy cover class as residual tree

crowns grow and ingrowth occurs. This is a tradeoff in that this alternative would not immediately result in as much improvement in desired canopy cover conditions but would improve species compositions to a greater degree and result in achievement of the desired canopy cover class conditions in the next 5 -20 years. This is consistent with Forest Plan guideline VEGU01 (USDA Forest Service 2003, pg. III-29) as this short term abundance of low canopy cover stands would move closer to the desired conditions within five to ten years and would aid in promoting early seral species tree vigor, treatment longevity, and long term species composition in these large tree stands.

In the short-term (5 to 10 years post treatment) many of the low canopy cover class stands in PVG 5 and 6 would move into the moderate canopy cover class as growth of residual tree crowns and natural regeneration are projected to add 1 percent to 2 percent of canopy cover per year in thinned stands. Much of the CT/FT treatment would only be reduced to the high end of the low canopy cover class (e.g. – post treatment canopy cover prescribed at 30-35 percent).

The shelterwood with reserves treatment (proposed on approximately 2,600 acres) would be anticipated to remain in the low canopy cover class for at least 10 to 20 years and would move into the moderate canopy cover class as artificial regeneration, natural regeneration, and residual tree canopy growth add canopy cover to these stands. In the long term, these stands would eventually contribute to the desired species composition as they develop through the stages of succession, another tradeoff.

Portions of large tree size class stands in PVG 2, 5 and 6 that would remain in the high canopy cover class have been deferred from treatment due to IRA/RNA management objectives, RCA protection, wildlife concerns (primarily northern goshawk nest stands), stands that would be best suited to regeneration treatment but have conflicting management area direction (no regeneration treatments per Forest Plan standard 0457 and 0509 [USDA Forest Service 2003, pgs. III-150 and III-159]), inaccessibility, and non-federal land ownership.

Alternative E

Alternative E would have similar effects to Alternative D in that the intensity of the treatments is the same; although, less acres of treatment have been proposed in Alternative E. See table FV-16, below.

Table FV-16 . Alternative E: Canopy Cover Class Effects

Alternative E: Canopy Cover Class Effects (Applies only to large tree size class stands)									
Canopy Cover Class	**Acres by PVG** (percentage in parenthesis)								
	PVG 2			**PVG 5**			**PVG 6**		
	Desired	*Existing*	***Post Treat***	*Desired*	*Existing*	***Post Treat***	*Desired*	*Existing*	***Post Treat***
Low	*2,567-3,261 (74-94)*	**304 (9)**	**1,928 (56)**	*1,737-3,126 (25-45)*	**893 (13)**	[3,954 (57)]	*0-2,062 (0-20)*	*196 (2)*	[4,356 (42)]
Moderate	*208-902 (6-26)*	[2,436 (70)]	[1,015 (29)]	*3,821-5,210 (55-75)*	**3,432 (49)**	**1,966 (28)**	*8,247-10,309 (80-100)*	**5,362 (52)**	**2,756 (27)**
High	*0 (0)*	[729 (21)]	[526 (15)]	*0 (0)*	[2,622 (38)]	[1,027 (15)]	*0 (0)*	[4,751 (46)]	[3,197 (31)]
Bold indicates a deficit, *italics* is within the desired range, and brackets [ ] indicate an overabundance									
This table displays immediate post treatment effects									

The immediate post treatment effects of Alternative E in PVG 2 would be a reduction in acres of the moderate and high canopy cover classes and the deficit of the low canopy cover class would be reduced, which moves toward the desired conditions. In PVG 5, there would be less acres of the high canopy cover class, moving toward the desired conditions; there would be less acres of the moderate canopy cover class, moving further from the desired conditions; and an excess of the low canopy cover class would be created. In PVG 6, there would be less acres in the high canopy cover class, moving toward the desired conditions; there would be an less acres in the moderate canopy cover class, moving away from the desired conditions; and an excess of the low canopy cover class would be created.

In the mid-term (5-15 years) the treatments in alternative E would move closer to and maintain canopies in the desired range for a longer period because the treatments would initially reduce canopy cover to lower levels than Alternative B or C. This is similar to the effects described in Alternative D regarding the intensity/longevity of benefits derived from the treatments. The rationale for moving more acres into the low canopy cover class than desired is consistent with Vegetation Guideline 01 in the Forest Plan (USDA Forest Service 2003, p. III-31) which recognizes that "tradeoffs in the achievement of one or more of the vegetative components described in Appendix A" may be considered. In this case, moving to lower canopy cover levels than desired for a short period (likely 5-10 years) would benefit species compositions trends in the project area. The benefits to species compositions are described below.

Summary of Canopy Cover Class

There would be no change in canopy cover class in the short term in Alternative A. This alternative would move further from the desired conditions for canopy cover class in the mid to long term.

In PVG 2, all action alternatives would move canopy cover conditions similarly toward the desired conditions. These conditions would be expected to be maintained for 10 to 30 years depending on the site, the vigor of residual trees and a variety of other factors (i.e. climate, insect and disease activity).

In PVG 5 and PVG 6, Alternative C would move the least acres toward the desired conditions with very little movement into the low canopy cover class and most acres treated into the moderate canopy cover class. Acres in the low canopy cover class would be expected to move more rapidly into the moderate canopy cover class as the most cover would be retained (post treatment) in this alternative.

In PVGs 5 and 6, Alternative B would move closer to the desired canopy covers than any of the other action alternatives in the short term (0-10 years post treatment) but as growth and ingrowth occur, acres moved into the low canopy cover class are expected to move into the moderate canopy cover class slightly more rapidly than Alternatives D and E. There would be a short term (approximately 5-15 year) overabundance of the low canopy cover class created with this alternative in PVG 6 but not as great of an overabundance as in Alternatives D and E.

In PVGs 5 and 6, Alternatives D and E would have similar effects on treated acres but Alternative E would treat less acres. Alternative D treats more acres of PVG 6 than any other action alternative. Alternative E would treat less acres of PVGs 5 and 6 than either B or D.

In PVGs 5 and 6, both alternatives D and E create an overabundance of the low canopy cover class for a longer duration than in Alternative B. The low canopy cover class would take slightly longer to move into the moderate canopy cover class than Alternative B (estimated 7-20 years vs. 5-15 years) because canopy cover would be reduced to slightly lower levels in Alternatives D and E. In the mid to long term, 10-30

years, Alternatives D and E would better meet the desired conditions for canopy cover class in PVGs 5 and 6.

In summary, all of the action alternatives would move toward the desired canopy cover conditions to varying degrees at different temporal timescales and the no action alternative would move further from the desired conditions. Tradeoffs in achievement of species compositions versus canopy cover desired conditions exists between the alternatives, which is consistent with Forest Plan direction. The amount of movement toward and the temporal scale of achievement varies between the alternatives with Alternative B, D and E creating an initial short term overabundance of the low canopy class. Creating this overabundance would be relatively short lived, as this overabundance of the low canopy cover class is anticipated to move into the moderate canopy cover class approximately 5-20 years post treatment depending upon the alternative selected.

Species Composition

Strata and working group data (USDA Forest Service 2002 and USDA Forest Service 2004) have been utilized to identify current conditions for species composition. The current and desired conditions are displayed in Table FV-7, above. Table FV-17, below, displays the acres of treatment per alternative that would improve species compositions.

Table FV-17. Acres of treatment proposed to benefit Species Composition.

Alternative	Acres of treatment proposed to maintain or promote desired Species Composition					
	NCT and targeted burn	***NCT only*** *(not targeted burning)*	***Thin only*** *(not targeted burning)*	***Thin and targeted burn***	***Regeneration treatment***	***Total acres of vegetative treatments*** *(sum of all treatments per alternative)*
A	0	0	0	0	0	**0**
B	16,300	1,700	6,600	14,600	900	**40,100**
C	20, 400	1,600	2,700	11,800	0	**36,500**
D	16,300	1,700	6,000	16,600	2,600	**43,200**
E	11,100	900	4,800	13,800	1,900	**32,500**
Targeted burn only not counted. NCT and targeted burn are estimations based on NCT and targeted prescribed fire treatment area descriptions. Only forested acres identified as targeted are included in these estimations.						
Thin = CT/FT, CT/MP and free thin portions of the FT/PC treatments. Regeneration = the patch cut portion of FT/PC (in Alt B) and shelterwood treatments in Alts D and E.						

Alternative A

Alternative A would result in vegetative conditions continuing to move away from desired conditions for species composition as no treatments would be implemented. Species composition would continue to trend toward shade-tolerant climax species, primarily grand fir and Douglas-fir, and to some extent Engelmann spruce as stand densities increase (Fiedler et. al. 2010). This alternative would cause continued departure from the desired conditions and eventually, if continued over the long term, would create conditions that would be difficult to restore to desired conditions.

It is expected that with the no action alternative, mortality in western larch, Douglas-fir and ponderosa pine would not only continue, but increase. The increase in mortality is expected given the current trend in local climatic conditions coupled with the current dense multi-layered stand conditions and recent insect activity (e.g. – western pine beetle and Douglas-fir beetle) common in the project area.

Alternative B

This alternative would treat up to 40,100 acres that would move species compositions toward desired conditions. Treatments have been broken into the following categories 1) NCT and burn, 2) NCT, 3) thin only, 4) thin and burn, and 5) regeneration treatment.

The NCT, NCT and burn and thin (i.e. – CT/FT, CT/MP, and free thin portion of the FT/PC) and burn treatment types would improve species compositions by reducing the abundance of climax species (i.e. grand fir and Douglas-fir). Anywhere aspen is present and in the drier PVGs (i.e. - PVG 1, 2, and portions of 5) these thin and burn treatments would aid in aspen regeneration by increasing light to the forest floor, creating a seed bed, and stimulating aspen suckers.

The regeneration treatments (i.e. - patch cut portions of the FT/PC) would move stands that are dominated by climax species to conditions that contribute to the desired species compositions by retaining early seral species which would contribute to the desired conditions.

In PVG 5 and 6, the CT/FT treatments in the large tree stands would retain canopy cover 30-45 percent, which equates to an average crown spacing of approximately 6-15 feet in mature stands. Because canopy cover is based on total non-overlapping canopy cover, small openings within each stand require that excess canopy cover be left in forested areas. Therefore, past experience has led to retention of basal areas in excess of 100-120 feet^2 in forested portions of each stand especially when post treatment canopy cover in excess of 35 percent is desired. The regeneration treatments proposed in this alternative are patch cuts with reserves and would occur on approximately 900 acres. Although, these regeneration treatments would be effective at re-establishing the desired species compositions in portions of stands, research and past experience indicate that growth rates would not be at their full potential in comparison to other regeneration methods (i.e. – shelterwood, seed tree, clearcut (York et. al. 2004). The light intensity due to retention of reserve trees and the small size (<10 acres) of the patch cuts is anticipated to reduce the growth rates of regenerated trees relative to the more intensive regeneration methods.

Prescribed burning and associated non-commercial thinning would also favor the desired species as ponderosa pine and western larch are generally more fire resistant and resilient to low intensity fire..

Alternative C

This alternative would treat 36,500 acres that would move species composition toward desired conditions. This alternative would also retain higher canopy closures than any of the other alternatives. To maintain the canopy densities prescribed in this alternative, canopy spacing after treatment would be 4-12 feet on average in mature stands. This would result in marking guidelines to retain approximately 3-10 feet between crowns of trees. Based on marking guidelines developed on other projects, this spacing results in densities in forested portions of the stand well in excess of 120 feet^2 to meet the stand canopy cover averages proposed in this alternative. At this density, the early-seral species such as aspen, ponderosa pine and western larch would be outcompeted due to the ability of climax species such as grand fir and Douglas-fir to thrive under more dense conditions. The result of managing at these densities is that the less vigorous, early-seral species are outcompeted and will continue to decline and die due to competition, less resistance, and less resilience to insect and disease and other stressors.

While treatments under this alternative would be better for the early-seral species than the no action alternative, they would not free the desired trees from crown and root competition in many cases as well as

in Alternatives B, D, and E, which generally allow for removal of some trees greater than eight inches in diameter to create more growing space and reduce competition.

Alternative C achieves the species composition goals for the project less than any of the other action alternatives. The combination of fewer acres proposed for treatment, less intense treatments, and exclusion of regeneration treatments in stands that have mostly converted to climax species contributes to this result.

Alternative D

Alternative D would treat 43,200 acres to move species composition toward desired conditions. Not only would this alternative treat the most acres but the treatments would be more intensive and have greater immediate benefits to changing species composition. The longevity of these benefits would also be greater than any of the other action alternatives due to creating more growing space and reducing the competition for light, nutrients and water.

The effects of acres treated with the NCT only and NCT and burn treatment would be identical to those described in Alternative B. These treatments would reduce tree densities in the large tree stands more in this alternative than in any of the other alternatives.

The regeneration treatments in this alternative (shelterwood with reserves) would allow for more light to reach the canopy floor and allow for better growth of the early seral species. Although there would still be reduced growth in regenerated trees due to the reserve trees and clumps, the larger treatment areas would allow for increased growth in comparison to the patch cuts.

The overall effect of this alternative is that species compositions would shift further toward the desired conditions than in any of the other alternatives as more of the grand fir would be removed and some stands with high percentage of grand fir and Douglas-fir would be regenerated with western larch and ponderosa pine being the favored species to regenerate.

Alternative E

The effects of alternative E to species composition would be similar to those described in Alternative D on treated acres. However, Alternative E would not move as far toward the desired species composition goals due to less acres (only 32, 500) being treated both commercially and non-commercially to improve species compositions.

Due to the reduction in amount of treatments, this alternative would not be as effective at meeting the species composition objectives. The treatments would be more effective at reducing competition with the desired residual trees and would have a longer duration of benefits on the treated acres than if Alternatives B or C were selected.

Summary of Species Composition

Overall, Alternative D would move species composition furthest toward the desired conditions in the project area as the treatments proposed are more intensive and would treat the most acreage. The intensity of the treatments in both Alternatives D and E would benefit the species composition objectives for a longer duration due to reduction in competition. Alternatives B and C would both aid in moving toward the desired conditions but the movement would not be as great, and the effectiveness of the treatments would not be for as great a duration as Alternatives D or E. Alternative A would continue to move species compositions further from the desired conditions.

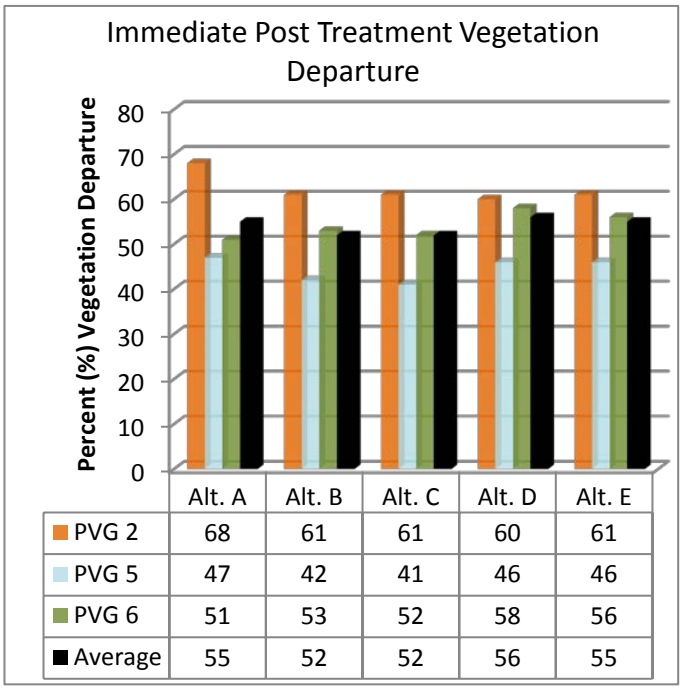
Spatial Pattern

Figures FV-2 and FV-3, below display the percent of vegetation departure from the reference conditions identified in Table FV-7, above. Figure FV-2 displays the immediate post treatment effects and Figure FV-3 displays the effects of the treatment approximately 25 years post treatment.

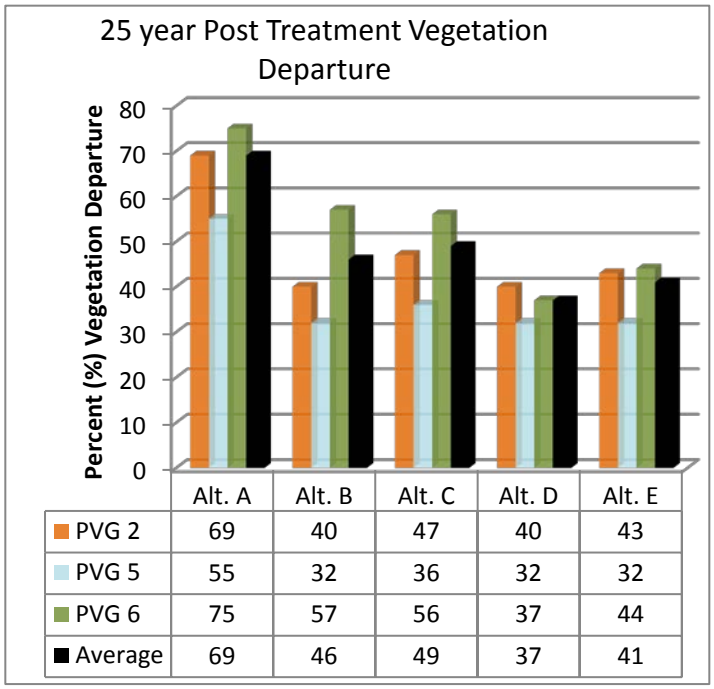
These predictions of vegetation departure from historic reference conditions are useful in quantifying the amount and proportion of different successional classes across the analysis area over time. These predictions of the spatial arrangement should not be viewed as exact amounts of movement, but as a relative comparison between various management scenarios by alternative and time scale to depict trends in the achievement of successional stages across the analysis area in comparison to the reference conditions. Although a twenty-five year temporal scale has been put on Figure FV-2, the temporal scale of these effects is difficult to accurately depict. Based on existing conditions, growth rates and the level of treatments (both amount and intensity), tree size class and canopy covers were estimated and successional classes as defined in the FRCC guidebook were utilized to calculate the departure of the vegetation at different temporal scales for each alternative.

The immediate post treatment effects vary between alternatives and by PVG (see Figure FV-2). Under all action alternatives, PVGs 2 and 5 would immediately move closer to the reference conditions. Alternatives B, D, and E would initially move further from the reference conditions primarily due to reducing canopy closures below the desired conditions on an abundance of acres as described in the Canopy Cover section of this analysis. It is useful to take a longer term view of the vegetation as it is dynamic and continually changing due to regeneration, growth, mortality and natural disturbance processes.

All of the action alternatives would move forested vegetation toward more historic conditions in PVGs 2 and 5. Only Alternatives D and E would successfully move PVG 6 toward the reference conditions in the long term (15-30 years post treatment).



	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E
PVG 2	68	61	61	60	61
PVG 5	47	42	41	46	46
PVG 6	51	53	52	58	56
Average	55	52	52	56	55



	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E
PVG 2	69	40	47	40	43
PVG 5	55	32	36	32	32
PVG 6	75	57	56	37	44
Average	69	46	49	37	41

Figures FV-2 and FV-3. Immediate and 25 Year Post Vegetation Departure

3.1.5 Cumulative Effects

The analysis area for cumulative effects is the project area. Cumulative effects combine the effects of the proposed action with conditions in and in the vicinity of the project area created by past, present and reasonably foreseeable actions. A more detailed list and descriptions of other projects and actions that may contribute to cumulative effects can be found in Appendix C of this document.

Past Actions

Past Fire Suppression

Federal fire suppression activities began as early as 1900 with significant improvements in funding and organization as early as the 1920s (Bean and Preston 1999). Fire suppression effectiveness increased throughout the 20s and 30s and the suppression has resulted in increased regeneration of fire prone species creating a landscape that is not within the desired range for species composition or tree density. The percentage of grand fir and the number of trees per acre of other climax species is increasing.

Past Wildfire

Recent records indicate two large wildfires in the project area the North Star Butte and Wesley fires. Prior to fire suppression efforts, wildfire was the primary disturbance agent responsible for stand development and succession.

Past Timber Harvest

The Lost Creek Boulder Creek Project area has been intensively managed for timber production. Available datasets indicate that timber harvest has occurred on approximately 34,700 acres within the project area. This is 54 percent of the forested area within the project area. This number is likely low because the data set utilized only records relatively intense treatments that occurred in the past 40 to 50 years. Field examinations of stands classified as unmanaged indicate that some harvest did occur in many of the accessible areas that are classified unmanaged prior to this time. Although harvests in these unmanaged areas were not as intensive as in areas where the data indicates that management has occurred, evidence is present that scattered harvest (typically of the large diameter ponderosa pine, Douglas-fir and western larch) did occur within some of these stands. Further general discussion of timber management practices on the Payette National Forest and in the project area can be found in the documents by Rinehart 1994 and Hockaday (1968).

Timber harvest included regeneration treatments (primarily clearcuts and some shelterwood with reserve and clearcut with reserve) on approximately 18,300 acres; and intermediate treatments (primarily improvement cutting and thinning with some sanitation and salvage) on the remaining 16,400 acres.

The majority of the regeneration treatments were completed prior to 1990. Records indicate that the regeneration treatments were initiated during the following time periods: approximately 52 percent prior to 1980; 23 percent between 1981 to 1990; and 22 percent between 1991 and 2000. The remaining 2 to 3 percent of the regeneration treatments were initiated since 2001. These regeneration treatments were typically planted with natural regeneration occurring on a relatively small percentage of the area. These treatments resulted in a variety of conditions ranging from stands with a variety of structure (6,350 acres are considered medium and large tree stands) to stands in the small tree size class (11,450 acres) to stands in the GFSS and sapling stages (450 acres). In the older clearcuts (primarily the small tree stands)

limited/no remnant overstory or other biological legacies occur. In more recently regenerated areas, objectives to retain biological legacies (i.e. snags, legacy trees, coarse woody debris) were often included and more structure and diversity exists within regenerated stands beginning in late 1980s with varying degrees of remnant trees, snags and coarse wood retained.

The intermediate treatments have resulted in a range of results including: where the forest canopy was sufficiently opened, early-seral species (ponderosa pine, Douglas-fir and western larch) are now growing in even-aged and multi-cohort stands. In more dense areas, and in habitat types where more light is required to successfully regenerate early-seral species, grand fir and other climax species have often successfully regenerated.

Recent projects that have harvested timber within the project area include the Upper Weiser, Upper Squirrel, Boulder Creek Thin, Squirrelly Billy, East Fork Lost Squirrel, and Lost Squirrel. The Quarter Round, North Round Valley and Warm Springs projects have also harvested timber immediately adjacent to the project area in the recent past. Numerous older sales were completed prior to the above sales listed that have affected the landscape through harvest but the effects of these have been captured in the description of the existing conditions.

Past Vegetation Management

A number of vegetation management activities, besides timber harvest, have occurred in the project area. These include prescribed burning and timber stand improvement (non-commercial thinning). Past activities have been included in development of the alternatives and in the analysis of effects.

Past Road Management

Road construction, maintenance and decommissioning have occurred in the project area. The effect of these activities on the ability to manage vegetation with traditional equipment is analyzed in the Transportation section of this document.

Present Actions

Current Projects

The East Fork Lost Squirrel Stewardship Contract is the only active vegetation management contract in the project area and it anticipated to be completed in the next six months. Commercial thinning for this project has been completed and road decommissioning, product haul and non-commercial thinning are still scheduled in the area.

Numerous prescribed fire projects have also been planned in the project area. The Prescribed Fire and Fuels section of this document explain ongoing prescribed fire activities.

Future Actions

Fire Suppression and Wildfire

Continued fire suppression in the project area is likely to occur. Although the success of initial attack activities is high the probability that a large wildfire would affect the project area is difficult to predict.

Continued fire suppression is anticipated to result in the continued growth and establishment of climax tree species and increased tree densities.

Summary

The effects of all past, present and reasonably foreseeable actions were considered in disclosing the current condition and direct and indirect effects in this analysis. The alternatives, along with past and future actions would cumulatively affect the forested vegetation component by either maintaining or moving it toward the desired conditions as described in the direct and indirect effects portion of this analysis.

3.1.6 Irreversible and Irretrievable Commitments

Regarding Forested Vegetation there are no irreversible or irretrievable commitments with any of the action alternatives.

3.1.7 Forest Plan Consistency

The desired vegetative conditions (USDA Forest Service 2003, Appendix A) for MPC 5.1 – Restoration and Maintenance Emphasis within Forested Landscapes have been utilized in MPC 5.2 – Commodity Production Emphasis within Forested Landscapes within the Lost Creek-Boulder Creek project area in order to incorporate the science of the draft WCS. This affects approximately 32,000 acres.

Timber Standard 0509 (USDA Forest Service 2003, pg. – III-159) for MPC 5.1 within Management Area 5 has also been applied to MPC 5.2 ground within this management area in order to incorporate the science of the draft WCS.

Timberland Resources

Alternative A would not be consistent with Forest Plan direction for timberland resources because no treatments are proposed and stands would not contribute to objective TROB01 nor would many plantations receive treatments to achieve TRGU01.

Alternatives B, C, D, and E are consistent with management direction for Timberland Resources contained in the Forest Plan.

All alternatives would be consistent with Standard 0457 (USDA Forest Service 2003, pg. – III-150) and Standard 0509 (USDA Forest Service 2003, pg. – III-159) regarding the ban on regeneration harvests within the Boulder Creek watershed.

Vegetation Resources

Alternative A is not consistent with Forest Plan direction for vegetation resources because no treatments are proposed and stands would continue to move away from the desired conditions.

Alternatives B, C, D and E are consistent with the Forest Plan direction for vegetation, timberland resources. Forest-wide guideline VEGU01 (USDA Forest Service 2003, p. III-31) acknowledges that tradeoffs in the achievement of desired conditions may need to be considered at different time scales. This analysis identifies areas where tradeoffs in these objectives (e.g. – Alternative D and E would move more stands into the low canopy cover class in the short term while better achieving desired canopy cover and species compositions in the mid to long term).

National Forest Management Act of 1976

Forest Service Manual and Handbook direction describes National Forest Management Act of 1976 consistency requirements. FSM 1921.12 and FSH 1909.12, Chapter 20-Section 29 and Chapter 60-Section 61 identify specific direction.

The following findings are required to be made when making project level decisions involving timber harvest:

Suitability for Timber Production (16 USC 1604(k)) – No timber harvest, other than salvage sales or sales to protect other multiple-use values, shall occur on lands not suited for timber production.

FS Response: Proposed timber harvest in within PVG 1 (USDA Forest Service 2003b, Appendix E) and in RCAs (USDA Forest Service 2003, pp. II-28 to II-30, TRST04, pp. III-43) are outside lands designated as suitable for timber production. Timber harvest in these areas in all action alternatives has been proposed to manage vegetation within the desired conditions specified in the Forest Plan for these areas. The action alternatives are designed to minimize potential impacts to other resources in these areas and PDFs were developed to mitigate potentially damaging actions. While non-commercial thinning and commercial treatments would occur in PVG 1, no salvage harvest or even-aged regeneration treatments would occur in lands not suited for timber production (e.g. RCAs or PVG 1).

Timber Harvest on National Forest Lands (16 USC 1604(g) (3) (E)) – A Responsible Official may authorize site-specific projects and activities to harvest timber on National Forest System lands only where;

a) *Soil, slope or other watershed conditions will not be irreversibly damaged (16 USC 1604(g) (3) (E) (i)).*

FS Response: Mitigation measures have been provided in the soil, watershed and fisheries analysis and would be incorporated into the project implementation design to insure that soil, slope, and watershed conditions would be adequately protected.

b) *There is assurance that the lands can be adequately restocked within 5 years after final regeneration harvest (16 USC 1604(g) (3) (E) (ii)).*

FS Response: According to local studies and Forest records, natural regeneration of ponderosa pine, western larch and Douglas-fir is variable depending upon the timing of activities and available cone crops. For this reason, artificial regeneration has been proposed as an option for any regeneration treatments. The desired reforestation goals for areas treated with regeneration treatments (e.g. patch cut or shelterwood) are consistent with TRST01 on page III-42 of the Forest Plan (USDA Forest Service 2003). Monitoring of regeneration success would begin one year after all proposed actions have been implemented (generally late summer, early fall). Monitoring would continue on a schedule of Year 1, Year 3, and Year 5. If natural regeneration is attempted, by exam Year 3 if exams indicate that natural regeneration is not progressing toward the desired seedling per acre goal and species composition, planting of trees suitable for the site (such as ponderosa pine, western larch, and/or Douglas-fir) would be considered. In some units, planting of ponderosa pine and/or western larch, regardless of natural regeneration success is planned to ensure the desired mixed of species occurs. In units where regeneration treatment occurs, if initial surveys indicate that advanced regeneration is

present in levels to meet desired future conditions. In these areas, a post-harvest evaluation will be done to ensure minimum reforestation stocking levels (per TRST01) are retained after salvage harvest.

c) *Protection is provided for streams, stream banks, shorelines, lakes, wetlands, and other bodies of water from detrimental changes in water temperatures, blockages of water courses, and deposits of sediment, where harvests are likely to seriously and adversely affect water conditions or fish habitat (16 USC 1604(g)(3)(E)(iii)).*

FS Response: Protection is provided for streams, stream banks, wetlands and other bodies of water from detrimental changes. Disclosure regarding the protection of stream, riparian and fish habitats would is contained in the Soil, Hydrology and Fisheries analyses by alternative. All action alternatives are consistent with the Forest Plan and would provide protection of stream, riparian, and fish habitat.

d) *The harvesting system to be used is not selected primarily because it will give the best dollar return of the greatest output of timber (16 USC 1604(g) (3) (E) (iv)).*

FS Response: The harvesting system proposed is the system determined to meet the purpose and need most effectively. The economic feasibility of this project was not the reason for developing the alternatives although in Alternative E, some of the more expensive treatment units (i.e. – units with helicopter logging systems and mature plantations) were dropped due to concerns identified by the public regarding the overall cost of the project.

Clear-cutting and Even-aged Management (16 USC 1604(G)(3)(F)) – Ensure that clear-cutting, seed tree cutting, shelterwood cutting, and other cuts designed to regenerate an even-aged stand of timber would be used as a cutting method on National Forest System lands only where applicable.

(i) for clearcutting, it is determined to be the optimum method, and for other such cuts it is determined to be appropriate, to meet the objectives and requirements of the relevant land management plan;

(ii) the interdisciplinary review as determined by the Secretary has been completed and the potential environmental, biological, esthetic, engineering, and economic impacts on each advertised sale area have been assessed, as well as the consistency of the sale with the multiple use of the general area;

(iii) cut blocks, patches, or strips are shaped and blended to the extent practicable with the natural terrain;

(iv) there are established according to geographic areas, forest types, or other suitable classifications the maximum size limits for areas to be cut in one harvest operation, including provision to exceed the established limits after appropriate public notice and review by the responsible Forest Service officer one level above the Forest Service officer who normally would approve the harvest proposal: Provided, That such limits shall not apply to the size of areas harvested as a result of natural catastrophic conditions such as fire, insect and disease attack, or windstorm; and

(v) such cuts are carried out in a manner consistent with the protection of soil, watershed, fish, wildlife, recreation, and esthetic resources, and the regeneration of the timber resource.

FS Response: The patch clearcuts and shelterwood regeneration methods proposed are designed to be consistent with Forest Plan direction and the desired conditions for the project. These treatments have only

been proposed in lands determined to be suitable for timber production. Due to these stands current condition they are no longer contributing to the desired conditions for vegetation in at least one aspect.

To meet the Forest Plan standard for vegetation management (USDA Forest Service 2003, p. III-29 and III-41) even-aged harvesting (patch cuts and/or shelterwood) would occur on lands suitable for timber production as it is the appropriate and optimum method for the timber type and would contribute to meeting vegetative objectives for the site. Such harvest would be consistent with the protection of soil, watershed, fish, wildlife, recreation, and aesthetic resources. Harvest areas would be blended to the extent practicable with the natural terrain and would retain reserve trees to meet wildlife, ecological, soil, visual, and other resource objectives. In addition, the regeneration treatments proposed would not technically qualify as openings due to reserve trees and clumps retained for purposes other than vegetation management in regenerated stands that would retain greater than 10 percent canopy cover. The maximum size of openings created by one regeneration harvest operation would not exceed 40 acres. A project design feature has been incorporated to limit regeneration treatments to less than 40 acres in size, therefore, no regeneration harvest (or opening) larger than 40 acres is proposed.

Establishment of standards to ensure culmination of mean annual increment of growth; silvicultural practices; salvage harvesting; exceptions (16 USC 1604(G)(3)(m))

The Secretary shall establish—

> *(1) standards to insure that, prior to harvest, stands of trees throughout the National Forest System shall generally have reached the culmination of mean annual increment of growth (calculated on the basis of cubic measurement or other methods of calculation at the discretion of the Secretary): Provided, That these standards shall not preclude the use of sound silvicultural practices, such as thinning or other stand improvement measures: Provided further, That these standards shall not preclude the Secretary from salvage or sanitation harvesting of timber stands which are substantially damaged by fire, windthrow or other catastrophe, or which are in imminent danger from insect or disease attack; and*
>
> *(2) exceptions to these standards for the harvest of particular species of trees in management units after consideration has been given to the multiple uses of the forest including, but not limited to, recreation, wildlife habitat, and range and after completion of public participation processes utilizing the procedures of subsection (d) of this section.*
>
> **FS Response:** Silvicultural prescriptions will be developed to ensure consistency with this requirement. The proposed regeneration treatments would occur in overmature stands. Intermediate treatments, that would harvest trees, are proposed in stands that have not yet reached the culmination of mean annual increment, but these treatments are consistent with the above exceptions and have considered the desired conditions and potential effects to recreation, wildlife, range, soils, water, economic, and fisheries resources.

3.1.8 Project Record

This DEIS hereby incorporates by reference the Forested Vegetation specialist report in the project record (40 CFR 1502.21). The report is located in the Forested Vegetation section of the project record and contains the data, methodologies, analysis, maps, references, and technical documentation that the specialist relied upon to reach the conclusions in this DEIS.

3.2 Fire and Fuels

3.2.1 Scope of the Analysis

The effects of the proposed action for fire and fuels management are analyzed for National Forest System lands within the Lost Creek Boulder Creek Project area.

3.2.2 Desired Condition

The desired condition for fire management on the forest as stated in the Forest Plan (p. III-38) is for both prescribed and wildland fire to be used as a tool to achieve and maintain vegetative conditions and desired fuel levels. Fire plays a natural role where appropriate and desirable, but is actively suppressed where necessary to protect life, investments, and valuable resources. Fire operates within historical fire regimes appropriate to the vegetation type and management objectives

Historic fire regime is the general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but including the influence of aboriginal burning (Agee 1993). Coarse-scale definitions for historic fire regimes have been developed by Hardy et al. (2001) and Schmidt et al. (2002) and interpreted for fire and fuels management by Hann and Bunnell (2002). The four historic fire regimes recognized on the Payette National Forest are classified based on the average number of years between fires (fire frequency) and effects on the dominant overstory vegetation (Table FF-1).

Table FF-1. Fire Regimes of the Payette National Forest

Fire Regime	Frequency (years)	Severity	Severity Description
Non-Lethal	5–25	≤10% mortality	Relatively homogenous with small patches generally less than 1 acre of different seral stages, densities, and compositions created from mortality
Mixed-1	5–70	>10–50% mortality	Relatively homogenous with patches created from mortality ranging in size from less than 1 to 600 acres of different seral stages, densities, and compositions
Mixed-2	70–300	>50–90% mortality	Relatively diverse with patches created by mixes of mortality and unburned or underburned areas ranging in size from less than 1 to 25,000 acres of different seral stages, densities, and compositions
Stand Replacement	100–400	>90% mortality	Relatively homogenous with patches sometimes greater than 25,000 acres of similar seral stages, densities, and compositions. Small inclusions of different seral stages, densities, and compositions often result from unburned or underburned areas

Because fire exclusion is the primary factor resulting in the significant change in landscape condition, the desired condition can best be depicted via the historic fire regimes of each potential vegetation group (PVG) within the project area (Table FF-2). Historically, 86 percent of the project area experienced frequent fires (low severity, high frequency). Nine percent of the project area experienced less frequent

fires of mixed severities; while only 4 percent of the project area experienced very infrequent fires of high severity. These percentages only include vegetated acres within the project area.

3.2.3 Existing Condition

Fire History

Past fire management actions within and adjacent to the project area have been the result of aggressive suppression directives. Historically, wildfire disturbances helped shape forested landscapes across the project area. Decades of fire exclusion, forest management, wildfires, insect outbreaks, and other factors have substantially altered forest structures, especially in the low- to mid-elevation ponderosa pine forest that comprises about 44 percent of the forested acres in the project area.

Due to suppression efforts the project area has not experienced many significant wildfires in the last century. The largest wildfire on record, the Wesley Fire, occurred in 2012 and grew to 16,405 acres; 5,522 acres were within the Lost Creek Boulder Creek Project area. The only three larger (greater than 100 acres) fires that occurred within the project area since the start of early suppression efforts all occurred in the last 20 years. Records show that the project area experienced 364 fire starts from 1956 to 2009, an average of seven fire starts per year. These fires were primarily kept to a tenth of an acre or less.

Table FF-2. Significant Recorded Wildfires (greater than 100 acres) within the Lost Creek-Boulder Creek Project Area

Fire Name	Year	Acres
Wesley	2012	5,522
North Star Butte	2004	1,030
Rock Jack	1996	117

Many starts have been recorded adjacent to the project area, but were also suppressed. The primary natural disturbance process has been excluded for approximately the last century.

No fire history studies have been performed within the project area. However, fire history studies on the Forest have been performed in the nearby Bear/Indian Creek drainages and Rapid River drainage. Although no data exists specifically from the Lost Creek Boulder Creek project area, it can be inferred from these fire history studies (Barrett 1987, 1994) that before the start of aggressive fire suppression in the early 1900's, primarily low severity – high frequency fires (14 - 40 year intervals) occurred in the dryer habitat types (ponderosa pine / Douglas-fir forests) and mixed severity fires of less frequency (43-69 year intervals) occurred in stands dominated by Douglas-fir and grand fir. It is important to note that tree ring research of historic fire frequency is generally conservative as very low severity fires do not consistently produce a fire scar.

Nonlethal to Mixed Severity Fire Regimes

Decades of commercial timber harvests have removed the larger and more fire-resilient tree species (such as ponderosa pine, Douglas-fir, and western larch), favoring species that are less fire-resilient (grand fir). Fire suppression has led to a buildup of ground, surface, and canopy fuels and favored the maturation of less fire-resilient species. Recurrent commercial harvests, fire suppression, and grazing have led to

- An increase in canopy densities;

- A decrease in canopy base heights (height to live crown);
- A change in species composition from a majority of more fire-resilient to less fire- resilient tree species;
- An increase in ground and surface fuels.

As a result, vegetation and fuel conditions are outside the historic range of natural conditions. Historically the drier forest types (PVGs 1, 2, and 5) of the project area consisted of a diverse understory of grasses, forbs, and low shrubs with a large-diameter fire-resilient overstory. This condition was maintained over time by frequent low-intensity fires. The moister, mixed severity fire regimes of PVGs 3, 4, 6, 7, and 11 occurred in the Douglas-fir, Grand fir, and white bark pine communities.

Stand Replacement Fire Regimes

The PVGs which historically have experienced stand replacement fires have the least departure from historic conditions. Due to the long fire return interval (average of 221 years), these areas have not been significantly altered by modern fire suppression.

Plantations (primarily among historically non-lethal and mixed-severity fire regimes)

From 1960-1990, approximately 25,000 acres of forest in the project area were harvested by clear-cut or shelter wood methods. Post-harvest, prescribed fire reduced slash and prepared the site for seeding. Since 1990, around half of the plantations which exist are viable timber stands, where the other half exhibit incredibly high fuel/brush densities.

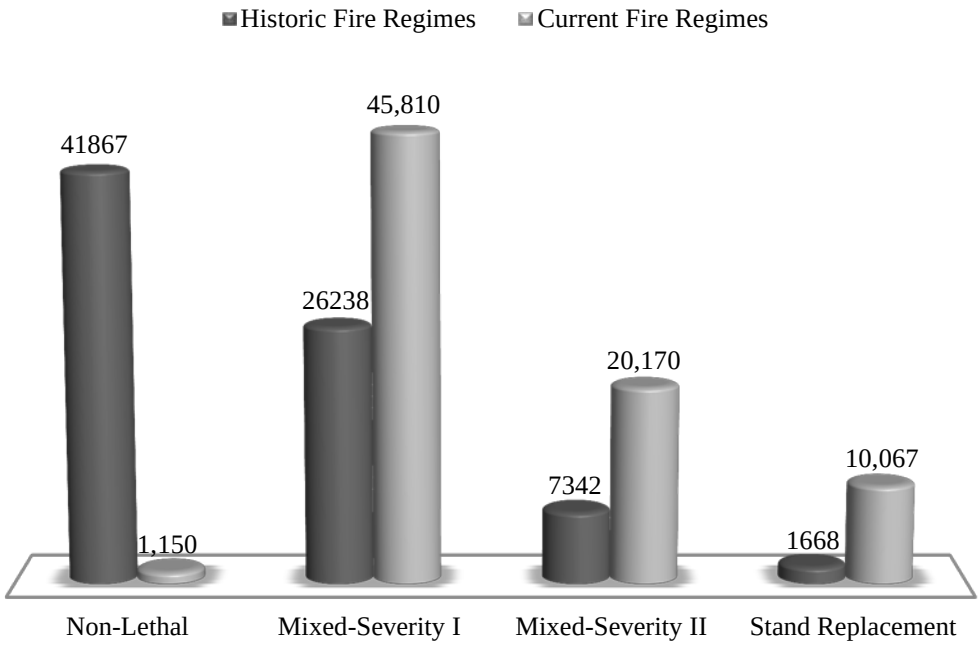


Figure FF-1. Distribution of Fire Regimes across the Lost-Creek Boulder Creek Project Area (in Acres)

A century of fire suppression and past timber management practices has shifted fire regimes towards more lethal fire severities. Approximately 86 percent (68,105 acres) of the project area has missed two or more fire return intervals. The extent to which a system has departed from historic conditions influences the extent to which key ecosystem components, critical to the integrity of the ecosystem, are altered. Many of the Non-lethal and Mixed-Severity I Fire Regimes acres have transitioned to Mixed-Severity II and Stand Replacement Regimes in the project area. This is consistent with the research by Sander's (1998), and Barrett (1987 and 1994) on the Payette National Forest indicating a shift in the fire regimes. This shift in fire regimes indicates that a higher percentage of the project area acres would likely burn at higher severities as well as larger patch sizes given a wildfire event. Uncharacteristic fire effects threaten desirable plant communities, ecological processes and the ability to protect life, investments, and other valuable resources (Barrett et al. 2010).

Management Areas

The Forest Plan describes the existing conditions for each Management Area. The following Management Area descriptions apply to the Lost Creek Boulder Creek Project area:

Weiser River Drainage – Management Area 3
"Succession is moving these stands outside their historic range of variation due to lack of disturbance." In the shrubland and grassland groups (Mountain Big Sagebrush and bitterbrush), past fire exclusion and grazing impacts have contributed to old, decadent stand conditions that are less resilient to fire and other disturbances *(Forest Plan III-124)*.

Rapid River Drainage – Management Area 4

"Cool Moist Grand Fir is functioning properly, but the risk of uncharacteristic fire is increasing due to fire exclusion and the increase in climax species and old structural stages. The Dry Grand Fir group is functioning at risk for an uncharacteristic fire that would not be within historical norms. Fire exclusion has created high stand densities and fuel loadings, a high percentage of grand fir, and shifted this group from a mixed severity to a lethal fire regime *(Forest Plan III-142)*."

Middle Little Salmon River Drainage – Management Area 5

"An estimated 21 percent of the area regimes have vegetation conditions that are highly departed from their historical range. Most of this change has occurred in the historically non-lethal fire regimes, resulting in conditions where wildfire would likely be much larger and more intense and severe than historically *(Forest Plan III-158)*."

3.2.4 Direct and Indirect Environmental Effects

Alternative A

The No-Action Alternative would move conditions in the project area further from desired conditions, primarily due to continued exclusion of fire from the ecosystem. Natural ignitions would not be capable of restoring fire given multiple values at risk that are adjacent to the project area. Without prescribed fire, fire frequencies will continue to decrease, severities will continue to increase, and fire regimes will continue to move away from historic conditions (Table FF-3). Additionally, risk to the public, private property, suppression crews, and other values within and adjacent to the project area will continue to increase.

Table FF-3. Projected Fire Return Intervals by Fire Regimes in Lost Creek-Boulder Creek Project Area under the No Action Alternative

Historic Fire Regime	Historic Mean Fire Return Interval[1]	Current (2013)		Projected for 2033	
		Fire Free Years[2]	Fire Return Interval Departure	Fire Free Years	Fire Return Interval Departure
Non-Lethal	15	102	6.8	**122**	**8.1**
Mixed-Severity I	37.5	102	2.7	**122**	**3.3**
Mixed-Severity II	185	102	0.6	**122**	**0.7**
Stand Replacement	250	102	0	**122**	**0**

[1]Based on Appendix E of the Draft WCS, Payette NF

[2]Estimate based on 1911 as being the first year of aggressive fire suppression in the project area.

Alternative B

This Action Alternative would significantly improve fire regimes conditions across approximately 37,600 acres where both, thinning and fire are prescribed (Tables FF-4 and FF-5). Additional improvements in fire regime conditions would occur among

- 13,200 acres of burn only (approximately 44 percent of these acres are non-forested grasslands)
- 8,300 acres of thin only

Treatments that only thin vegetation without the application of fire would aid in restoring historic fire regimes. The potential for sustained crown fire spread would be significantly reduced, but individual tree torching and uncharacteristically high severities remain as surface fuels and individual crown base heights remain low (Brown et al. 2004, Graham et al. 2004, Agee and Skinner 2005). Additionally, the ecological function of fire within this fire dependent system would not be restored.

In areas where fire is the only treatment prescribed, fire regimes would move towards historic conditions, but changes in vegetative conditions within forested areas would occur at a slower rate than in areas that are thinned prior to the application of fire (Brown et al. 2004). In many of the drier habitat types that remain dominated by seral tree species, fire alone would sufficiently move current conditions towards desired conditions.

Where stand structure and species composition would be altered mechanically or by hand to restore historic conditions and where fire is reintroduced, fire regimes would move towards historic conditions at the greatest rate (Graham et al. 1999, Brown et al. 2004, Stephens and Moghaddas 2004, Agee and Skinner 2005, Ritchie et al. 2006, Harrod et al. 2009, Stephens et al. 2009).

Restoring vegetative structure and composition as well as the primary disturbance process (fire), would improve the integrity of the landscape and its resilience to wildland fires. However, “ecosystem restoration treatment and fuel treatment are not synonymous” (Reinhardt et al. 2008). In some stand conditions opening stands would increase rates of spread and increase the average number of days that a stand would carry fire due to reduction in both, shading from the sun and sheltering from the wind. Restoring fire

regimes within the Lost Creek Boulder Creek Project area would alter predicted fire types from conditional to active crown fires to primarily surface fires with passive crown fires.

Table FF-4. Acres of Significant Movement toward Historic Fire Regimes by Alternative within Lost Creek-Boulder Creek

Historic Fire Regime	Vegetated Project Area Acres	Percent of Each Fire Regime Significantly Improved by Alternative			
		Alt. B	Alt. C	Alt. D	Alt. E
Non-Lethal	41,867	*66%*	*67%*	*68%*	*44%*
Mixed-Severity I	26,238	*32%*	*23%*	*32%*	*14%*
Mixed-Severity II	7,342	*<1%*	*<1%*	*<1%*	*<1%*
Stand Replacement	1,668	*<1%*	*<1%*	*<1%*	*<1%*
TOTAL / Percent of project area significantly improved	77,155	**37,600**	**38,000**	**38,700**	**30,400**
		49%	*49%*	*50%*	*39%*
Note: It has been assumed that stand treatments consisting of both, thinning and burning would have the greatest impact in restoring fire regimes. Therefore, these acres would likely result in significant improvements. Additionally, grasslands proposed for burning are included in these acres of significant improvement.					

Table FF-5. Acres of Improved Historic Fire Regimes by Alternative within Lost Creek-Boulder Creek

Treatment	Alt. B	Alt. C	Alt. D	Alt. E
Thin and Burn (Stands)	31,800	32,200	32,900	24,900
Thin Only (Stands)	8,300	4,300	10,300	7,600
Burn Only (Stands)	7,400	7,000	6,300	1,100
Burn Only (Grasslands)	5,800	5,800	5,800	5,500
Total	**53,300**	**49,300**	**55,300**	**37,000**

Restoring historic fire regimes in fire adapted systems leads to a multitude of desirable stand and landscape scale effects (Keane et al. 2002). For example:

- Decreases in shade-tolerant tree species, increases in forage quality, increases in plant vigor and stand productivity, decreases in canopy closure, increases in early seral communities, decreases in landscape homogeneity, decreases in dominance of single patch type, and increases in patch diversity
- Decreases in vertical fuel ladders and their continuity, reduction in ground and surface fuel loadings, and increases in decomposition rates
- Decreases in fire intensities and severities, reduction in potential for crown fires (pre and one year post treatment fire behavior modeled using NEXUS version 2.0 and assuming stands are both thinned and burned),
    - *Fire types* would move from active or conditional crown fires to surface fires under historically representative weather and fuel conditions (Table FF-6).
    - *Surface flame lengths* in the
        - historically non-lethal fire regimes would decrease from 11 to 3 feet,

        - historically mixed-severity and stand replacement fire regimes would decrease from 5 and 2 feet to 1 foot.
    - *Rates of spread* in the
        - historically non-lethal fire regimes would decrease from 108 to 21 chains per hour (1 chain equals 66 feet),
        - historically mixed-severity and stand replacement fire regimes would decrease from 85 to 1 chain per hour.
- Decreases in risk to the public, private property, suppression crew, and other values within and adjacent to the project area

Table FF-6. Comparison of Critical Thresholds Initiating Crown Fire Conditions within Units Proposed for Both, Thinning and Prescribed Fire

Fire Regime	Critical Fire Indices	Current Conditions	Post Treatment Conditions
Non-Lethal	Torching Index	0	61
	Crowning Index	18	25
	Flame Length Initiation	3	7
Mixed-Severity I	Torching Index	29	100+
	Crowning Index	16	22
	Flame Length Initiation	3	7
Mixed-Severity II	Torching Index	21	100+
	Crowning Index	19	32
	Flame Length Initiation	2	9
Stand Replacement	Torching Index	30	100+
	Crowning Index	20	34
	Flame Length Initiation	2	9

Torching Index = the 20-ft wind speed at which some kind of crown fire (passive or active) is expected (miles/hour)

Crowning Index = the 20-ft wind speed at which active crown fire is possible (miles/hour)
Flame Length Initiation = the minimum surface fire flame length required to initiation some kind of crown fire (feet)

Alternative C

This Action Alternative would significantly improve fire regimes conditions across 38,000 acres where both, thinning and fire are prescribed. Additional improvements in fire regime conditions would occur among

- 12,800 acres of burn only (approximately 45 percent of these acres are non-forested grasslands)
- 4,300 acres of thin only

Direct and indirect effects of this Alternative to the indicator (acres moved towards the historic fire regime) are consistent with Alternative B except in amount of total acres improved. Changes in predicted fire type, flame length, and rates of spread remain constant with the action alternatives.

Alternative D

This Action Alternative would significantly improve fire regimes conditions across 38,700 acres where both, thinning and fire are prescribed. Additional improvements in fire regime conditions would occur among

- 12,100 acres of burn only (approximately 48 percent of these acres are non-forested grasslands)
- 10,300 acres of thin only

Direct and indirect effects of this Alternative to the indicator (acres moved towards the historic fire regime) are consistent with Alternative B except in amount of total acres improved. Changes in predicted fire type, flame length, and rates of spread remain constant with the action alternatives.

Alternative E

This Action Alternative would significantly improve fire regimes conditions across 30,400 acres where both, thinning and fire are prescribed. Additional improvements in fire regime conditions would occur among

- 6,600 acres of burn only (approximately 64 percent of these acres are non-forested grasslands)
- 7,600 acres of thin only

The direct and indirect effects to the fire and fuels indicator (acres moved towards historic fire regimes) would be less in Alternative E than in Alternatives B, C, or D. Direct and indirect effects of this Alternative to the indicator (acres moved towards the historic fire regime) are consistent with Alternative B except in total acres treated. Changes in predicted fire type, flame length, and rates of spread remain constant with the action alternatives.

3.2.5 Cumulative Effects

Cumulative effects were assessed over the last century and the next decade of activities. Greater emphasis was given to more recent activities. Cumulative effects were analyzed within the project boundaries and the area immediately adjacent (within one mile) to the project perimeter. Actions occurring outside this analysis area are not likely to affect the fire and fuels indicators associated with the project. Essentially, cumulative effects upon the fire and fuels indicator remain constant across all alternatives. Differences lie within acres moved towards historic fire regimes and associated effects. These effects are discussed in direct and indirect effects analysis.

Past Fire Suppression

The need for this project is in part a result of past fire suppression actions. It is most likely that fires will continue to be managed with a suppression objective due to the immediate values at risk (e.g., adjacent private, state, and BLM lands). Therefore, restoring/maintaining the historic fire regimes within the project area would be accomplished primarily through management ignitions.

Past Timber Harvest

The need for this project is partly a result of past timber harvests. Past harvest favored the removal of large fire adapted species and left less fire tolerant size classes and species. This contributed to the altered fire severities across the project area, moving primary fire severity from low to mixed and mixed to high.

Timber Stand Improvement / Pre-commercial Thinning

Current and future thinning activities consistent with the current Forest Plan would aid in moving conditions towards desired/historic conditions because the thinning prescription would support the development of vegetative structure and composition of conditions defined in Appendix A of the Forest Plan. The current condition of many of these plantations is not conducive to supporting historic fire frequencies and severities (i.e., fire severities are likely to be much higher than those within the historic range).

Range Allotment and Historic Livestock Use

Livestock use has led to minor effects to the fire regimes within the project area, both positive and negative. Grazing decreases the available flashy fuels that contribute to fire spread. Therefore, grazing may decrease the amount of fire (natural disturbance) across the landscape, but this may benefit efforts to protect local values at risk.

Noxious Weeds and Invasive Plant Management

Noxious weeds have the potential to impact the fire regime, but due to limited densities and current weed management actions, weeds are not likely to impact the fire regime.

Past and Ongoing Activities within and Adjacent to the Project Area

There are 4 completed projects that have improved fire regime conditions within the project area in the last 10 years by improving species composition and stand structure. These projects include:

- Boulder Creek Timber Stand Improvement Stewardship
- Lost Valley Squirrel
- Price Valley Squirrel
- Upper West Fork Weiser River

Three ongoing restoration projects within the project area improve fire regimes by restoring historic species composition, stand structure, and fire frequency. These projects include:

- East Fork Lost Creek NIDGS Habitat
- NIDGS Habitat Maintenance Prescribed Fire
- Upper Weiser Fire Regime Condition Class

Three ongoing restoration projects adjacent to the project area that focus on restoring fire regimes include:

- Muddy Squirrel
- Rapid River Prescribed Fire
- Warm Springs Fuels Reduction

Overall, these projects will have beneficial effects to the landscape in regards to fire regimes. Wildland fires are less likely to be large-scale and have uncharacteristic effects if adjacent land areas have been recently treated with fire. These projects include thinning that would move vegetative structure and species composition towards more historic conditions, favoring fire adapted conditions. Additionally, overall fire

behavior across the landscape would be reduced, thereby decreasing the potential threat of a wildland fire and improving fire fighter effectiveness.

Private Lands and Other Ownerships

Private lands and lands managed by other agencies adjacent to the project area have and will continue to lead to the suppression of wildland fires within and outside of the project area. This will result in a constant demand for prescribed fire in order to support efforts to restore/maintain the historic fire regime.

3.2.6 Irreversible and Irretrievable Commitments

Regarding fire and fuels management there are no irreversible or irretrievable commitments with any of the Action Alternatives.

3.2.7 Forest Plan Consistency

All four action alternatives are consistent with the Forest Plan direction for Fire Management standards and guidelines. These action alternatives would move the current condition toward desired conditions.

3.2.8 Project Record

This DEIS hereby incorporates by reference the Fire and Fuels specialist report in the project record (40 CFR 1502.21). The report is located in the Fire and Fuels section of the project record and contains the data, methodologies, analysis, maps, references, and technical documentation that the specialist relied upon to reach the conclusions in this EIS.

3.3 Watershed Resources

3.3.1 Scope of the Analysis

The analysis area spans across two subbasins (4th level hydrologic units); the Little Salmon River and the Weiser River. The Little Salmon drains north to the Salmon River and the Weiser drains south to the Snake River. The analysis area for watershed resources extends beyond the project area to include Boulder Creek to its confluence with the Little Salmon River, the West Fork of the Weiser River to its confluence with the Weiser River, and the Upper Weiser River above the confluence with Beaver Creek (Figure WS-1). It is approximately 164 square miles (104,821 acres).

The analysis area for direct and indirect effects to watershed resources is shown in Figure WS-1. It includes National Forest System, State, and private lands. Drainages and subdrainages within the analysis area were analyzed for changes to peak flows by evaluating the Equivalent Clearcut Area (ECA) and Channel Risk Rating (CRR). The Boulder Creek subwatershed was modeled using the BOISED model to analyze differences between alternatives for the percent over natural sediment induced by the proposed project activities.

The cumulative effects analysis area within the Weiser River subbasin includes the entire West Fork of the Weiser River watershed, including Lost Creek and the Upper Weiser River to the confluence with the West Fork of the Weiser River. In the Little Salmon River subbasin, cumulative effects are evaluated for the entirety of Boulder Creek to the confluence at the Little Salmon River. The cumulative effects area totals 134,136 acres or approximately 210 square miles. Available data describing activities on State and private lands were included in the cumulative effects analysis. In general, actions and the effects within the next 3 to 15 years are considered short term, while effects lasting longer than 15 years are considered long term. Figure WS- 1 displays the area analyzed for direct, indirect, and cumulative effects.

3.3.2 Desired Condition

Forest Plan Direction

The following is a description of the desired condition for Soil, Water, Riparian, and Aquatic Resources from the 2003 Forest Plan. "Riparian and aquatic ecosystems have appropriate types and amounts of vegetation. There is sufficient large woody debris appropriate for land and stream channel forms to maintain water quality, filter sediment, aid floodplain development, improve floodwater retention and groundwater recharge, and contribute to diverse habitat components. Management actions result in no long-term degradation of soil, water, riparian, and aquatic resource conditions. Instream flows are sufficient to support healthy riparian and aquatic habitats, the stability and effective function of stream channels, the ability to route flood discharges, and provide for downstream uses. Wetlands and floodplains are maintained where they are properly functioning and restored where degraded. Improving watershed condition contributes to the de-listing of water quality limited water bodies to meet Clean Water Act requirements. Public waters are restored where water quality does not support beneficial uses and is otherwise maintained or improved (Forest Plan page III-18)".

Management direction for Soil, Water, Riparian, and Aquatic Resources is found in Chapter III of the Forest Plan (Forest Plan, III-18). Management direction specifically applicable to the planning area includes:

- SWOB07 - *Work within the State's timelines to assist the State in the identification of 303d impaired water bodies, development of TMDLs, and development of TMDL Implementation Plans.*
- SWOB1- *During fine-scale analysis, identify opportunities to restore degraded upland and aquatic habitat conditions in order to support productive and diverse populations of native and desired non-native aquatic species to meet social needs and tribal interests.*
- *Opportunities should focus on restoring passage for fish and other aquatic species, and restoring desired ranges of water temperature, large woody debris, streambank stability, sediment levels, water chemistry, and pool size and numbers. Refer to the Watershed Condition Indicators in Appendix B.*

Forest Plan Goals and Objectives

- SWOB05 - *Cooperate with the State, Tribes, other agencies and organizations to develop and implement Total Maximum Daily Loads (TMDLs) and their implementation plans for 303d impaired water bodies influenced by National Forest System management.*
- SWOB1 - *Reduce road-related effects on soil productivity, water quality, and aquatic/riparian species and their habitats. Refer to the Watershed and Aquatic Recovery Strategy (WARS) for mid-scale prioritization indicators to assist in fine and site/project scale restoration prioritization planning.*
- SWGO02 - *Provide for stream channel integrity, channel processes, and the sediment regime under which the riparian and aquatic ecosystems evolved.*
- SWST01 - *Management actions shall be designed in a manner that maintains or restores water quality to fully support beneficial uses and native and desired non-native fish species and their habitat, except as allowed under SWRA Standard 04 (below). Use the MATRIX located in Appendix B to assist in determining compliance with this standard.*
- SWST04 – *Management actions would neither degrade nor retard attainment of properly functioning soil, water, riparian, and aquatic desired conditions, except:*

a) *Where outweighed by demonstrable short- or long-term benefits to watershed resource conditions.*

b) *Where the Forest Service has limited authority (e.g., access roads, hydropower, etc.) In these cases, the Forest Service shall work with permittee(s) to minimize the degradation of watershed resource conditions. Use the MATRIX located in Appendix B to assist in determining compliance with this standard.*

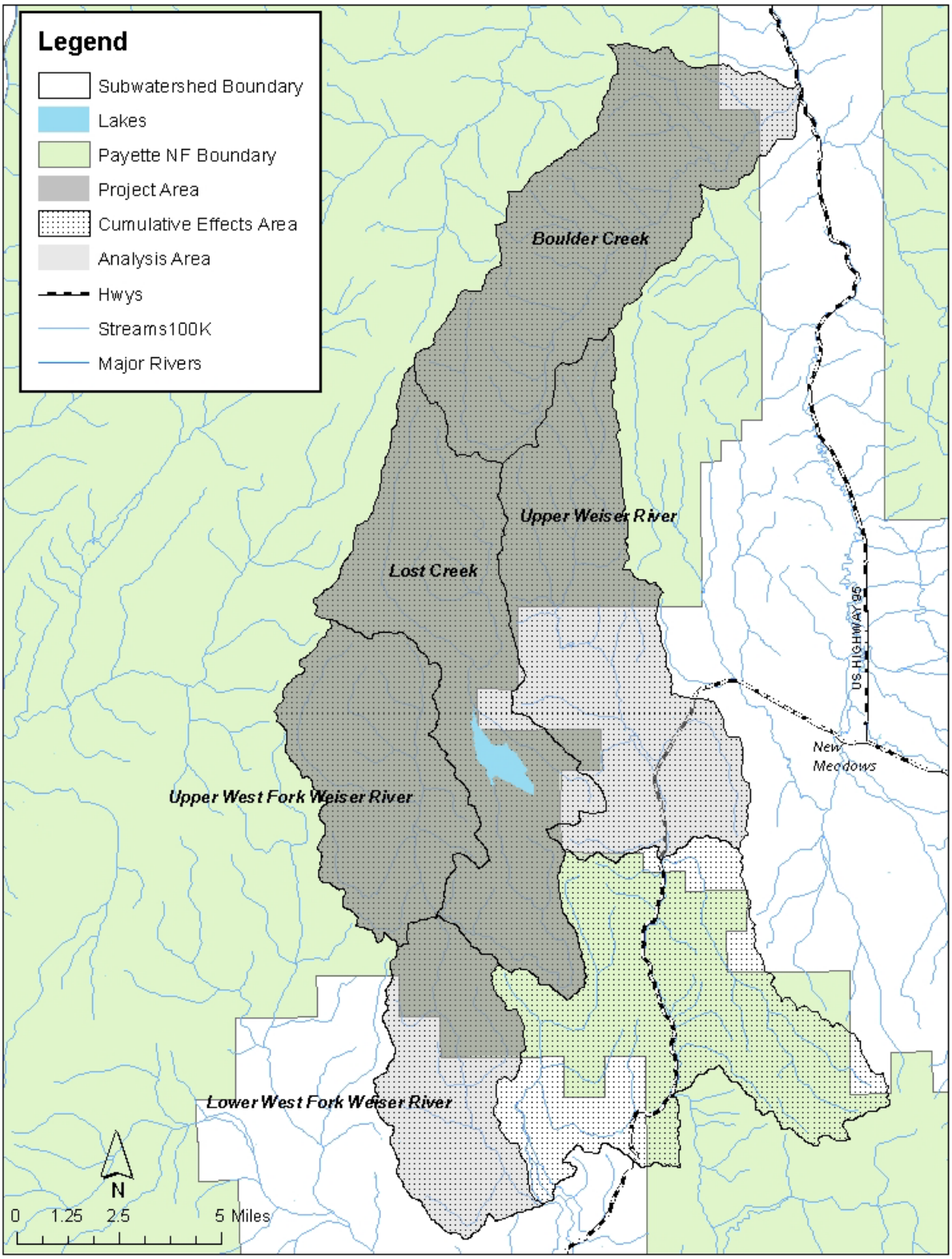


Figure WS-1. Watershed Analysis Area for Direct, Indirect and Cumulative Effects.

- FROB04 - *During fine-scale analysis identify opportunities to reduce road-related degrading effects to help achieve other resource objectives.*
- FROB06 - *Identify roads and facilities that are not needed for land and resource management and evaluate for disposal or decommissioning.*
- FRGU04 – *Roads that are not desired for public access or tribal uses, and that are no longer needed to manage the Forest or to provide access to inholdings should be considered for decommissioning and returning the lands that they occupy to desired resource management.*
- FRGU05 – *Where practical alternatives exist, roads in RCAs that are degrading riparian-dependent resources should be evaluated for obliteration or relocation.*

Management direction specific to MA3:

Objective 0318: Improve water quality and assist in de-listing 303(d) water bodies by reducing road-related accelerated sediment through a combination of road decommissioning, relocation, reconstruction, and maintenance in the Mann Creek, Pine Creek, West Fork Weiser River, East Branch Weiser River, East Fork Weiser River, Middle Fork Weiser River, and Little Weiser River drainages. The Little Weiser River drainage includes the Upper Little Weiser and Anderson Creek subwatersheds.

Objective 0320: Restore riparian areas by relocating or hardening dispersed recreation sites in the Mann Creek, Cabin Creek, Lost Creek, and Anderson Creek drainages, and the horse camping area in the Jungle Creek drainage.

Management direction specific to MA4:

Objective 0429: Improve water quality by reducing road-related accelerated sediment through a combination of road closure, obliteration, decommissioning, relocation, reconstruction, and maintenance in the upper portion of the Lower Boulder Creek subwatershed.

Objective 0433: Restore fish habitat in the upper portion of the Lower Boulder Creek subwatershed by emphasizing aquatic connectivity (removal of fish barrier culverts) and reducing riparian road densities.

Objective 0434: Maintain habitat conditions to provide for strong local populations of bull trout in the Copper-Castle, Fry Pan-Paradise, Lake Fork Creek, Upper Rapid River, and Lower Boulder Creek subwatersheds.

Objective 0435: Continue ongoing culvert removal projects to resolve existing fish passage problems, primarily in Lower Boulder Creek subwatershed.

Management direction specific to MA5:

Objective 0518: Improve water quality and geomorphic integrity by reducing road-related accelerated sediment throughout the management area.

Objective 0520: Restore fish habitat for native species--including threatened chinook salmon, steelhead trout, and bull trout--in the Upper Boulder Creek subwatershed, by reducing road-related accelerated sediment and continuing to remove culverts that impede migration of these species.

Objective 0522: Restore equivalent clearcut area (ECA) values toward the range of desired resource conditions.

Watershed Condition Indicators (WCIs)

The 2003 Payette Forest Plan developed reference condition values of ecological indicators, or WCIs, which are useful as diagnostic tools to assist in comparing and evaluating current soil, water, riparian, and aquatic watershed conditions. WCIs provide a means for assessing how management actions may potentially influence the condition and trend of aquatic resources, including threatened, endangered, proposed, and candidate fish species (TEPC), soil, water, and riparian resources (Forest Plan pp. B-1 to B-21). WCIs also provide a functioning appropriately level or desired future condition for various parameters. Appendix II of this report describes the environmental baseline for WCIs for the analysis area. The indicators analyzed for this project evaluate important WCIs that have the potential to affect water quality with the proposed activities and include:

- Sediment/Turbidity
- Floodplain connectivity
- Road density and location
- RCAs
- Changes in peak flow and/or base flows
- LWD

Forest Plan Desired Condition

The desired condition would be for WCIs to move toward a functioning appropriately level, wherever achievable. Many WCIs for the drainages within the planning area are at the Function at Risk or Functioning at Unacceptable Risk Category. Generally, restoration activities that reduce road density by obliteration of roads, especially in RCAs and landslide prone areas, would move watershed resources toward desired conditions. Additionally, improvement or removal of stream crossings and rehabilitation of existing skid trails, landings, or other identified watershed improvement needs would successfully move soil productivity, water quality, riparian areas, and aquatic resources toward desired conditions.

The desired condition for identified watershed improvement needs, fish passage barriers, and erosion problems, would be to resolve issues with a site specific restoration treatment or adjusted management and return long-term soil productivity, fish habitat connectivity, and hydrologic function to the sites. Streams with bank stability issues would be improved to restore riparian vegetation, percent ground cover, and stabilization of channel geometry. No sites would continue to degrade. No loss of shade to streams within the West Fork of the Weiser watershed would occur to insure attainment of the temperature TMDL. Bacteria and nutrient levels in streams and lakes would continue to be below state standards.

Purpose and criteria from the Title IV – Forest Landscape Restoration

The purpose of the Title IV Forest Landscape Restoration Act is to encourage the collaborative, science-based ecosystem restoration through a process that demonstrates ecological techniques that achieve ecological and watershed health objectives. The collaborative landscape restoration criteria direct the consideration of watershed health, retention of large trees, and the improvement of fish and wildlife habitat (including listed species). The Act specifies that project not establish permanent roads and promotes the maintenance of existing system road. Unneeded roads and trails are to be decommissioned and rehabilitated.

Forest Service Manual and other Legislation Direction Regarding Road Decommissioning

The Forest Service Manual directs the Forest Service to identify roads no longer needed for access and decommission them. Objectives and treatments are also specified in handbook direction:

FSM 7703.25 – Decommissioning Roads. Use travel analysis (FSM 7712; FSH 7709.55, Chapter 20) to identify roads that may not be needed for the use and management of NFS lands; to identify roads that could be converted to trails; to identify restoration needs; and to establish decommissioning priorities. Unauthorized roads, temporary roads, and any NFS roads no longer needed for the use and management of National Forest System (NFS) lands should be decommissioned. Do not designate temporary roads or unneeded roads for motor vehicle use, and do not show unneeded roads on an MVUM.

FSM 7734.02 – Objectives

Stabilize, restore, and re-vegetate unneeded roads to a more natural state to protect and enhance NFS lands.

FSM 7734.1- Decommissioning Treatments - Decommission a road by reestablishing vegetation and, if necessary, initiating restoration of ecological processes interrupted or adversely impacted by the unneeded road. Decommissioning includes applying various treatments, including one or more of the following:

1. Reestablishing former drainage patterns, stabilizing slopes, and restoring vegetation;
2. Blocking the entrance to a road or installing water bars;
3. Removing culverts, reestablishing drainages, removing unstable fills, pulling back road shoulders, and scattering slash on the roadbed;
4. Completely eliminating the roadbed by restoring natural contours and slopes; and
5. Other methods designed to meet the specific conditions associated with the unneeded road.

In addition, the Forest and Rangeland Renewable Resources Planning Act (16 U.S.C. 1608), requires that within 10 years after it is determined that a road is no longer needed, vegetative cover be reestablished on the road by either artificial or natural means.

Road Treatment Terminology used for this Analysis

Road decommissioning is the removal of a road from the Forest System network. Usually includes a high level of restoration treatment of the road with the objective of meeting Forest Service manual direction listed above.

Road obliteration is a type of decommissioning treatment designed to restore soil productivity and hydrologic function. It includes, but is not limited to, preventing access for motorized use, ripping the road surface to a depth of 16 inches, recontouring to the natural slope profile, redirecting road runoff, applying slash on the road surface, and seeding. Any existing culverts at stream crossings are removed and fill slopes pulled back, stabilized, and revegetated. Ripping the road surface fractures compacted road surface, establishes natural drainage, increases infiltration rates, and promotes long-term soil productivity. Re-shaping of the road prism restores hydrologic function by preventing interception of shallow springs and subsurface water by the cut slope and channelization alongside ditches or roadbed.

Long Term Closure is designed to reduce surface erosion on existing roadbeds. It may include all or some of the following: preventing access for motorized use; scarifying and seeding road and ditch surfaces; redirecting road runoff where necessary; removal of existing culverts at stream crossings and pulling back

and revegetating fill slopes. Stabilization does not recover detrimental soil disturbance, total soil resource commitment, or hydrologic function. The objective is to stabilize the roadbed from surface erosion and water drainage issues so road maintenance can be minimized.

Road to Trail Conversion - Road to trail conversion is a type of decommissioning treatment designed to reduce surface erosion on existing roadbeds, but maintain a tread for hiking, horseback riding, motorized use, or mountain bikes. It may include all or some of the following: preventing access motorized use; scarifying and seeding road and ditch surfaces; redirecting road runoff where necessary; removal of existing culverts at stream crossings and pulling back and revegetating fill slopes. Road to Trail Conversion may partially recover detrimental disturbance, total soil resource commitment, and hydrologic function. The objective is to stabilize the roadbed from surface erosion and water drainage issues so road maintenance can be minimized and maintain the route for recreational access.

Watershed Condition Framework

In 2011, the Watershed Condition Classification Categorization process was completed on the Payette NF as part of a national effort (Potyondy and Geir 2010). Three watershed condition classes were recognized directly related to the degree or level of watershed functionality or integrity;

Class 1 = Functioning Properly;

Class 2 = Functioning at Risk; and

Class 3 = Impaired Function

All of the subwatersheds within the project area were identified as Condition Class 3- Functioning Impaired subwatersheds, except for the Lower West Fork Weiser which is categorized as Class 2 – Functioning at Risk. A Class 3 Subwatershed has impaired function because some physical, hydrological, or biological threshold has been exceeded. Substantial changes to the factors that caused the degraded state are commonly needed to set them on a trend or trajectory of improving conditions that sustains physical, hydrological, and biological integrity. By contrast, a Class 1 watershed in properly functioning condition has minimal undesirable human impact on natural, physical, or biological processes and is resilient and able to recover to the desired condition when disturbed by large natural disturbances or land management activities (Potyondy and Geir 2010).

Boulder Creek was designated as a priority watershed under the Watershed Condition Framework (WCF) where restoration activities will concentrate on the explicit goal of maintaining or improving watershed condition. The intent of the national direction is to, first and foremost, protect high-value watersheds already in good condition, maintain the condition of watersheds to keep them from becoming threatened and, then, improve those in an impaired condition. For priority watersheds, forests will develop a Watershed Restoration Action Plan that identifies specific projects necessary to improve watershed condition class. A detailed field assessment is the basis for the action plan. The assessment should document specific problems affecting watershed and ecological conditions; identify appropriate projects that address these problems; propose an implementation schedule; and project sequencing, potential partners, funding sources, monitoring, and evaluation.

3.3.3 Existing Condition

Watershed Characteristics

The Boulder Creek subwatershed drains into the Little Salmon River which is recognized by the Payette NF Forest Plan as an ACS priority subwatershed due to habitat for anadromous listed fish species. It is identified as a high priority for active restoration. The WCF has also categorized it as Condition Class 3 (Impaired Function) due to past harvest, road density, roads within RCAs, habitat fragmentation, and other indicators. The WCF also recognized it as a Focus Watershed, and directs that a Watershed Restoration Action Plan be developed to improve watershed conditions. Boulder Creek has been evaluated by IDEQ as fully supporting beneficial uses.

The headwaters of the Weiser River consist of the East and West Branch of the Weiser River and comprise the on-forest portion of the Upper Weiser subwatershed. The West Fork of the Weiser (WFW) also includes the major tributaries from the east, Lost Creek and East Fork Lost Creek. The WCF has categorized the Upper Weiser, Lost Creek, and the Upper West Fork of the Weiser subwatersheds as Condition Class 3 (Impaired Function) due to past harvest, road density, roads within RCAs, and other indicators. The Lower West Fork of the Weiser subwatershed is in Condition Class 2 (Functioning at Risk). The West Fork of the Weiser River was listed as an impaired waterbody for temperature on the 2006 303(d) list. A TMDL for temperature was established in the Weiser River TMDL Temperature Addendum published by IDEQ in June of 2006.

Elevations range from approximately 8048 feet at the summit of Pollock Mountain, to 3030 feet at the confluence of the West Fork of the Weiser and the Weiser River. Surface geology is dominated by Grande Ronde and Imnaha Basalts of the Columbia River Basalt Group. Intrusive rocks of the Idaho Batholith along with some metamorphic gneiss are found near the suture zone in the northern portion of Boulder Creek. The environmental analysis for the 2003 Forest Plan identified subwatersheds as having low watershed vulnerability and low geomorphic and water quality integrity due to past harvest levels and high road density, especially near stream channels. Subwatersheds are identified as an Active Moderate Restoration Priority in the 2003 Forest Plan.

Average annual precipitation in the analysis area ranges from 30 to 45 inches. Much of the precipitation that falls on the landscape is delivered to streams as deep seepage and subsurface flows rather than overland flows. Seasonal variation in streamflows is generally a function of the amount of snowmelt runoff (Forest Service USDA 1973b). The area follows a typical hydrologic regime for central Idaho, with most annual precipitation falling as snow in the winter months and a snowmelt dominated hydrograph. The peak flow occurs during mid-April to late-May and reaches base flow by late July.

The frequency and effect of rain-on-snow events is a concern to land managers. Storms of short duration are normally easily absorbed and stored by the snowpack and underlying soil at elevations above 4,500 feet. Storms of long duration can saturate the snowpack and soil mantle. This saturation can lead to slumping, slides, and overland flow, causing mass erosion, plugged culverts, and subsequent road failures. Short-duration (15-minute) rainstorms with intensities of one to three inches per hour occur almost annually. Storms that deliver a full inch or more in less than one hour are infrequent, occurring about once every 100 years. Storm events lasting longer than a day generally do not cause major problems. Areas where damage may be expected are areas with less ground cover, overgrazed lands, and lands heavily

altered by mining or harvesting, particularly roads and skid trails where interception, channeling, and overland flow occur.

Current Condition of Watershed Condition Indicators

The Forest Plan Appendix B identifies the desired condition for Watershed Condition Indicators (WCIs) at the subwatershed scale. Many of WCIs are Impaired or Functioning at Risk categories.

Many subwatersheds have road densities that are contributing to reductions in long-term soil productivity, road-related sediment contributing to stream channels, negative effects to floodplains and riparian conservation areas (RCAs), and changes to hillslope hydrology due to the intersection of subsurface water by cutslopes. Effects to channel stability, peak flows, and stream channel resiliency are likely due to past harvest, livestock grazing, and roads.

Sediment - Existing management-induced (BOISED - percent over natural) sediment yield is estimated in Table WS-2 for the analysis area. The primary source of accelerated sediment is roads throughout the analysis area. The BOISED model predicts that in 2013 Boulder Creek will produce 5.1 percent over natural sediment. This reflects part of the sediment estimated from the Wesley Fire which occurred in 2012. The baseline percent over natural sediment is 4.5 for Boulder Creek. Currently the sediment WCI is functioning at risk for the Boulder Creek, Lost Creek, Upper Weiser, and Upper West Fork of the Weiser River subwatersheds. It is functioning appropriately for the Lower West Fork of the Weiser. (Note: the sediment WCI is evaluated differently for the watershed resource than in the Fisheries analysis. Only surface fines criteria are assessed in the Fisheries analysis.

Floodplain Connectivity/ Road Density and Location/RCAs – Roads near streams can impair a stream's ability to access its floodplain. This can have detrimental effects on bank stability, bank erosion, and the channel's ability to handle peak flows. Loss of floodplain connectivity can increase flooding potential downstream, because the flood flows no longer have access to the associated wetlands that naturally evolved adjacent to the stream. Within the analysis area a total of 176 miles of open and closed road are located within RCAs, which may be contributing to a decrease in floodplain connectivity. Currently floodplain connectivity and RCAs are functioning at risk. Road density and location are functioning at unacceptable risk.

Change in Peak Flows/Base Flows - Moderately High equivalent clearcut area (ECA) values and high road densities for the analysis area may be resulting in higher peak flows and a change in the timing of peak flow events. Currently this WCI is functioning at risk for some subwatersheds within the analysis area.

Table WS- 1. Subwatershed WCF Rating and Restoration Priority.

Subwatershed or drainage (as identified by 2003 Forest Plan)	2003 Payette Forest Plan Restoration Type/Priority	Watershed Condition Framework Rating[1] (as identified by 6th Field subwatershed)
Upper West Fork Weiser River	Active/Moderate	Impaired (Class 3)
Lower West Fork River	Active/Moderate	Functioning at Risk (Class 2)
Upper Lost Creek	Active/Low	Impaired (Class 3)
Lower Lost Creek	Active/Moderate	

Subwatershed or drainage (as identified by 2003 Forest Plan)	2003 Payette Forest Plan Restoration Type/Priority	Watershed Condition Framework Rating[1] (as identified by 6th Field subwatershed)
Upper Weiser River (East and West Branches)	Active/Low	Impaired (Class 3)
Boulder Creek	Active/High Identified Priority Watershed	Impaired Identified Priority Watershed (Class 3)

Sediment

Natural erosion rates have been accelerated by human-caused disturbances that have reduced vegetative cover and altered the hydrologic function of soils. The water quality parameter of most concern is sediment. Accelerated production of sediment and delivery of this material to streams is associated with road building, livestock grazing, recreation, and timber harvest activities. Unstable stream channel conditions were documented in tributary streams (USDA Forest Service 1973; USDA Forest Service 1994-1997; USDA Forest Service 2000-2003), and attributed to current and past cattle grazing and effects from roads.

The BOISED sediment yield model calculates predicted sediment delivered to streams for the analysis area based on past harvest, road, and fire events. The measure "percent over natural" is the predicted amount of sediment from management activities that is above the natural level that would be expected for each watershed without management activities. Natural erosion rates are based on the inherent erodability of landtypes described in the Soil-Hydrologic Reconnaissance Survey, New Meadows Ranger District, Payette National Forest (Thompson et al 1973). The BOISED model evaluates surface and mass erosion to provide estimates of natural sediment yields. Model outputs are expressed as average annual yields of total sediment from a watershed. Actual sediment yields for individual years may vary from modeled values by an order of magnitude or more. Results are not reliable predictions of absolute sediment quantities and are best used for developing a quantitative index of cumulative sediment yield from different management proposals within a watershed (Reinig et al. 1991). See Appendix E for BOISED Modeling Assumptions.

Table WS-2. BOISED Sediment Yield Estimates within the analysis area for 2013

Subwatershed(s)/Drainage Analyzed in BOISED Sediment Model	2013 Estimated Total Percent Over Natural Sediment	2013 Percent Harvest Related Sediment	2013 Percent Road Related Sediment	2013 Percent Fire Related Sediment
Boulder Creek	5.3	1	88	11
West Fork Weiser River (including LWFW and Lost Creek)	17.7	3	95	2
Upper West Fork of Weiser River (above Lost Creek)	23.1	0	100	0

Subwatershed(s)/Drainage Analyzed in BOISED Sediment Model	2013 Estimated Total Percent Over Natural Sediment	2013 Percent Harvest Related Sediment	2013 Percent Road Related Sediment	2013 Percent Fire Related Sediment
Upper Weiser River	19.5	1	98	1
Lost Creek (including EF Lost)	13.7	6	91	3

The analysis area was modeled using the BOISED model. The portions of the project area with no proposed activities that extend into state land and were not within the analysis area were excluded. The BOISED model estimates that the subwatersheds within the analysis area are producing approximately 5 to 23 percent more sediment than natural rates. Logging on Forest Service lands within the last 10 years is estimated to have sediment input concurrent to the proposed action during the timeframe analyzed. The model predicts that this logging activity will contribute sediment up until about 2017. Prescribed fire planned in East Fork Lost Creek (East Fork Lost Creek NIDGS Improvement Project) will have effects through 2027. Additionally, the Wesley fire occurred in 2012 which results in some sediment delivery through year 2015.

Roads can have a major impact on watershed integrity due to increased sediment into streams, increased drainage efficiency, and interruption of subsurface flow (King 1989). Roads located adjacent to stream channels have the most opportunity to deliver sediment directly into stream channels and to intercept subsurface flow if there is a cut slope constructed (Nelson 1994). There are currently 176 miles of road within the analysis area that exist within RCAs. BOISED does not have a spatial component and is not reflective of the additional sediment reduction that may occur when roads near streams are decommissioned. Existing roads are the major source of the over natural sediment according to the BOISED model results (Table WS-1).

Sediment that is delivered to stream channels in the watershed can be stored behind rocks and logs or transported downstream. High flows transport most of the bedload in any given year. Variability in climatic conditions such as intense rainfall, rain on snow conditions, or a heavy snowpack melting quickly, can all influence how and when sediment moves through the stream network and is transported downstream.

Roads

A Travel Analysis Process was completed in January of 2013 for the project area. The ID team performed a review of all initial recommendations and refined them based on local knowledge, field inventories, and other available data. Recommendations were made after discussions with the ID team and the rationale for recommendations recorded in the roads rating table. Management recommendations were made based on resource concerns, redundant road locations, road locations within RCAs, and access needs for future management and the public. Roads with recommendations of “Maintain”, “Maintain or Improve”, or “Improve” designations are considered as recommendations for the Minimum Road System (MRS). Roads with “Decommissioning” recommendations will not be designated as part of the MRS. For those roads with an “IDT Evaluate” recommendation, there was a differing Vegetation Management Emphasis Option and a Watershed Restoration Emphasis Option which would be analyzed at the project level to determine the

final Minimum Road System determinations. The Travel Analysis Report for the D3 Coalition Planning area will be provided as part of the planning record for this project and is available at the New Meadows RD (PNF 2012).

There are currently 473 miles of forest system roads, other special use and private roads, and approximately 167 miles of mapped unauthorized roads within the project area. The road density is as high as 8.5 miles per square mile for the Upper West Fork of the Weiser River subwatershed.

Peak Flows and Channel Conditions

Equivalent Clearcut Area (ECA) is a general index of the disturbance in a watershed from harvest activities over time. It broadly describes the vegetation condition in forested watersheds and correlates it to potential increases in water yield and changes in the timing of peak flows. The amount of area in an ECA condition and the related hydrologic effects has been discussed in several studies. Generally, most studies dating back to the 1960s in forested zones have shown an increase in stream flow following forest cutting followed by a gradual decrease as the area is reforested (Hibbert 1967; Stednick 1996; Megahan and Hornbeck 2000). In the western Cascades streamflow studies have indicated that forest harvesting has increased peak discharges as much as 50 percent in small basins and 100 percent in large basins over the past 50 years. These increases are attributable to changes both in flow routing due to roads, and in water balance due to treatment effects and vegetation succession (Jones and Grant 1996). The ECA procedure makes the assumption that increased peak flows may represent increases in stream flow sufficient to alter the channel depending on the channel characteristics (King 1989). Increases in the duration of flows near bankfull may lead to bank and bed erosion problems in susceptible channels (Troendle and King 1985).

The procedure used to calculate ECA for the analysis area is described in Forest Hydrology Part II, Hydrologic Effects of Vegetative Manipulation (USDA Forest Service 1974a). Roads are included in the calculation of ECA. Existing vegetation conditions related to ECA were evaluated using stand strata information contained in the timber stand inventory data.

The analysis area was delineated into 39 smaller drainages that best represented the size range of drainages analyzed in reference studies. Drainages that are true watersheds having only one outlet were calculated for the ECA percent based on their drainage area. Composite areas along the mainstem are giving a rating that is based on all the drainage areas above. The drainages are displayed in Figure WS-3. The current conditions for the small drainages are displayed in Table WS-3 through WS-6. The current ECA for the drainages throughout the analysis area ranges from 0 to 48 percent. Many are within the range where increases in peak flows may occur (greater than 25 percent) (Haupt 1967; Stednick 1996; Megahan and Hornbeck 2000).

Rosgen Channel Types range from low gradient C and E types to steep rocky A and B types. Sensitivity to disturbance is very high for A3 types, extreme for A4 types and moderate for B4 types. Streambank erosion potential is high for A3 types, very high for A4 types, and moderate for B4 types. Channel Risk is determined by evaluating the ECA and inventoried channel stability, and considering the sensitivity to disturbance assigned by Rosgen Stream Type (Rosgen 1996). Streams with finer substrate such as cobble or finer particles have more vulnerability to bank instability. These variables combine to determine a Channel Risk Rating for each drainage within the analysis area (Bailey 2004). Channel Risk Rating for individual drainages is low for 13 drainages, moderate for 15, and high for 11 drainages. Composite areas within the subwatersheds were not included in this total.

The 11 drainages rated High for CCR include: Squirrel and Pollock Creek (Boulder Creek), Yantis Ditch Tributary (Upper Weiser River), Tributaries 5, 6, and 7 to the East Branch of the Weiser, Intermittent Tributary to the West Branch of the Weiser River, Sheep Creek (WFWR), Bear and Finn Creek (Lost Creek), and the Headwaters of Lost Creek.

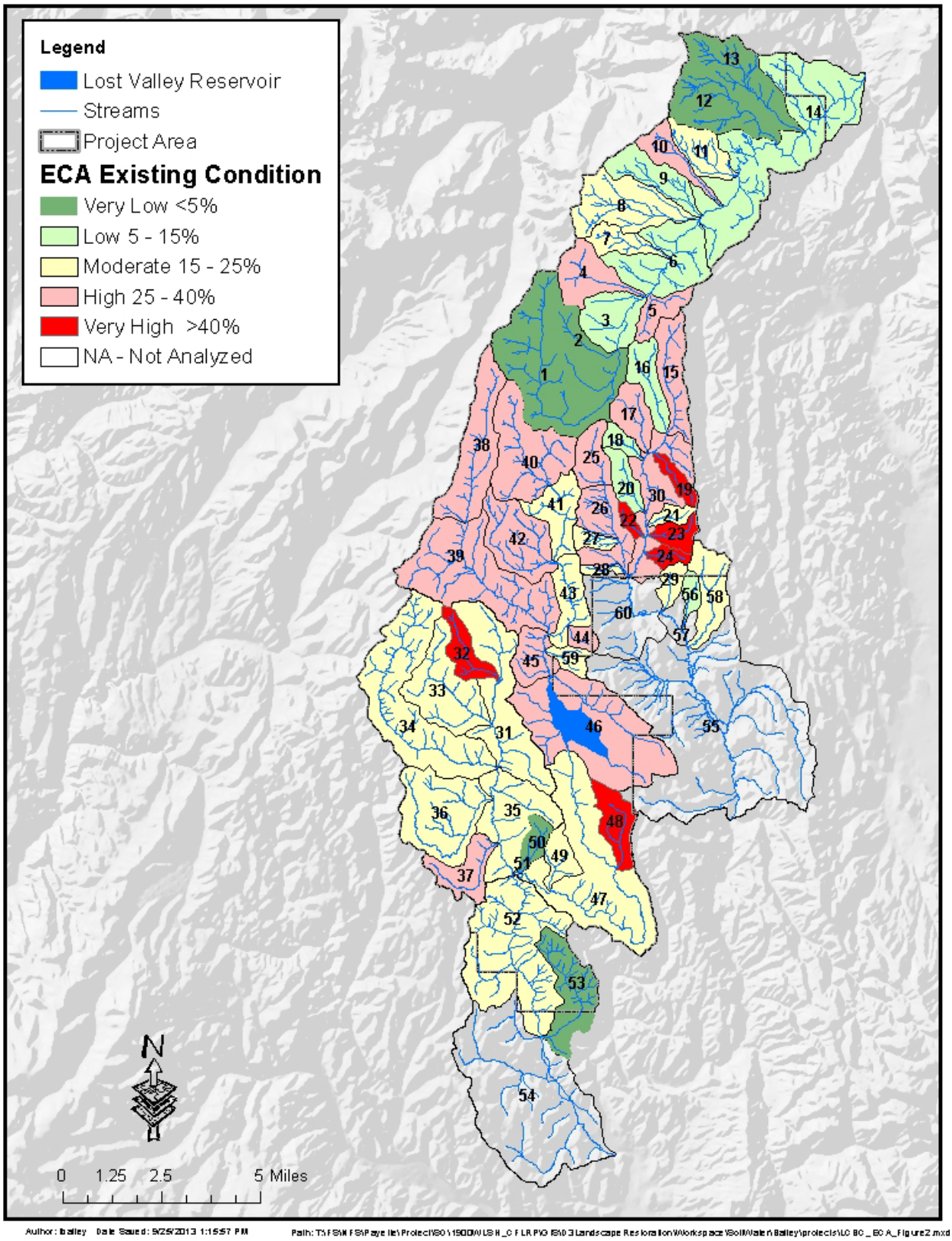


Figure WS-2. ECA for the Drainages within the Watershed Analysis Area

Table WS-3. Channel Condition Risk for Boulder Creek Drainages within Analysis Area

Boulder Creek									
Drainage	**Drainage Name**	**Acres**	**ECA percent**	**ECA Rating**	**Channel Stability[2]**	**1970-71 stream Inventory**	**Rosgen Channel Type[1]**	**Channel Sensitivity/Bank Erosion Potential[1]**	**Channel Risk Rating**
1	Upper Boulder Creek	4580	10%	Low	Fair	Good	B4	Moderate	Moderate
2	Twin Fork Creek	792	11%	Low	Good	Good	A2	Very Low	Low
3	Composite A	1224	11%	NA	Fair	Good	B3	Low	NA
4	Ant Basin Creek	1188	11%	Low	Fair	Fair	B3	Low	Low
5	Huckleberry Creek	605	45%	Very High	Good	Good	B3	Low	Low
6	Composite B	2137	33%	NA	Good	Good	B3	Low	NA
7	Yellow Jacket Creek	614	21%	Moderate	Good	Good	B3	Low	Low
8	Star Creek	1980	14%	Low	Fair	Fair	B3	Low	Moderate
9	Bull Horn Creek	1087	15%	Low	Fair	Fair	B3	Low	Low
10	Cold Springs Creek	728	33%	High	Fair	Good	B3	Low	Low
11	Pollock Creek	908	14%	Low	Fair	Good	A4	Extreme	High
12	Pony Creek	1852	20%	Moderate	Good	Good	A3	Very High	Low
13	Squirrel Creek	1884	0%	Very Low	Fair	Poor	A3	Very High	High
14	Composite C	5566	0%	Very Low	Fair	Good	B3	Low	NA
Boulder Creek Total[3]		25145	15%	Low to Moderate	Fair	Good	B3	Low	Low

See Table WS-5 for key to footnotes

Table WS-4. Channel Condition Risk for Upper Weiser River Drainages within Analysis Area

Upper Weiser River									
Drainage	**Drainage Name**	**Acres**	**ECA percent**	**ECA Rating**	**Channel Stability[2]**	**1970-71 stream Inventory**	**Rosgen Channel Type[1]**	**Channel Sensitivity/Bank Erosion Potential[1]**	**Channel Risk Rating**
15	Upper Composite on East Branch*	1238	41%	High	Good	Fair	B4	Moderate	NA
16	West Fork of EB	892	39%	High	Good	Fair	B4	Moderate	Moderate
17	Yantis Ditch	797	30%	High	Fair	Good	B4	Moderate	High
18	Trib 1 to EB	317	30%	High	Good	Good	B4	Moderate	Moderate
19	Trib 2 to EB	366	55%	Very High	Good	Good	B5	Moderate	Moderate
20	Trib 3 to EB	560	20%	Moderate	Good	Good	B4	Moderate	Moderate
21	Trib 4 to EB	278	52%	Very High	Fair-Poor	Good	B5	Moderate	High
22	Trib 5 to EB	197	26%	High	Fair-Poor	Fair	B4	Moderate	Moderate
23	Trib 6 to EB	457	46%	Very High	Fair-Poor	Good	B3	Low	Moderate
24	Trib 7 to EB	279	48%	Very High	Fair-Poor	Fair	B4	Moderate	High
25	Upper WB	777	32%	High	Poor	Poor	A3	Very High	High
26	Composite on WB*	1331	35%	High	Fair	Good	B4	Moderate	NA
27	Trib 2 to WB	287	43%	Very High	Good	Good	A3	Very High	High
28	Trib 1 to WB	132	17%	Moderate	Fair	Good	B6	Moderate	Moderate
29	Intermittent Trib	367	13%	Low	Fair-Poor	Good	G4	Extreme	High
30	Lower Composite on EB*	1786	39%	High	Fair-Poor	Good	C4	Very High	NA
Upper Weiser Total[3]		10,060	16%	Moderate	Fair-Poor	Good	C4/F4	Very High/Extreme	High

See Table WS-5 for key to footnotes.

Table WS-5. Channel Condition Risk for West Fork Weiser River Drainages within Analysis Area

West Fork Weiser River									
Drainage	**Drainage Name**	**Acres**	**ECA percent**	**ECA Rating**	**Channel Stability[2]**	**1970-71 stream Inventory**	**Rosgen Channel Type[1]**	**Channel Sensitivity/Bank Erosion Potential[1]**	**Channel Risk Rating**
31	Headwaters WFWR	2924	32%	High	Fair	Good	B3	Low	Moderate
32	Sheep Creek	746	38%	High	Fair	Fair	B4	Moderate	High
33	Corral Creek	2062	22%	Moderate	Good	Good	A3	Very High	Moderate
34	Grouse Creek	4281	26%	High	Good	Good	B3	Low	Low
35	Composite D*	2101	25%	Moderate	Good	Good	B3	Low	NA
36	Fourth of July Creek	2592	18%	Moderate	Fair	Fair	B3	Low	Moderate
37	Rock Creek	977	28%	High	Good	Good	A2	Very Low	Low
52	Lower WFWR*	4438	5%	Low	Good	Good	B4	Moderate	NA
53	Rocky Gulch	1723	3%	Very Low	Fair-Poor	Good	B3	Low	Low
West Fork Weiser Total[3]		54121	22%	Moderate	Good	Fair	B4	Moderate	Moderate

1 Rosgen 1996

2 Pfankuch Stream Channel Stability Score (Pfankuch 1975)

5 - Very low < 5%; Low 5-15%; Moderate 15-25%; High 25-40%; Very high > 40%.

3 Main Stem at mouth of analysis area.

NS – Not surveyed; NA – Not applicable; *Composite watershed or interfluvial

4 Almost entirely off-forest.

Table WS-6. Channel Condition Risk for West Fork Weiser River Drainages within Analysis Area

Lost Creek									
Drainage	**Drainage Name**	**Acres**	**ECA percent**	**ECA Rating**	**Channel Stability[2]**	**1970-71 stream Inventory**	**Rosgen Channel Type[1]**	**Channel Sensitivity/Bank Erosion Potential[1]**	**Channel Risk Rating**
38	Headwaters Lost Creek	2235	20%	Moderate	Fair	Fair	B6	Moderate	Moderate
39	Middle Upper Lost*	4051	27%	High	Fair	Fair	C4	Very High	NA
40	Upper EF Lost Creek	2514	32%	High	Fair	Good	B3	Low	Moderate
41	Middle EF Lost Creek*	1092	37%	High	Fair	Good	B3	Low	NA
42	Butter Gulch	1774	25%	Moderate	Fair	Fair	B4	Moderate	Moderate
43	Lower EF Lost Creek	958	30%	High	Fair-Poor	Fair	C4	Very High	NA
44	Tributary 2a to EF Lost	267	48%	High	Fair-Poor	Good	B3	Low	Moderate
45	Lost Creek abv LVR	802	36%	High	Fair-Poor	Poor	C5	Very High	NA
46	Lost Valley Reservoir*	4691	25%	High	Fair-Poor	Fair	B5	Moderate	NA
47	Lower Lost Creek	4554	29%	High	Good	Good	B3	Low	Low
48	Bear Gulch	940	54%	Very High	Fair	Fair	A3	Very High	High
49	Finn Creek	569	19%	Moderate	Fair-Poor	Good	A3	Very High	High
50	Rough Creek	305	6%	Low	Fair	Good	A2	Very Low	Moderate
51	Unnamed Trib to Lower Lost Creek	131	6%	Very Low	Fair	Fair	A2	Very Low	Moderate
59	Unnamed Trib abv Reservoir	357	21%	NS		Good	NS	Moderate	NS
Lost Creek Total[3]		25240	28%	High	Fair	Good	B3	Low	Moderate

1 Rosgen 1996

2 Pfankuch Stream Channel Stability Score (Pfankuch 1975) 5 - Very low < 5%; Low 5-15%; Moderate 15-25%; High 25-40%; Very high > 40%.

3 Main Stem at mouth of analysis area. NS – Not surveyed; NA – Not applicable; *Composite watershed or interfluvial

4 Almost entirely off-forest.

Level II Riparian Surveys

Riparian surveys were conducted in the Lost Creek-Boulder Creek project area during 1991-1997 and 2000-2003 in support of other Forest activities and follow the general format of the Region 4 Riparian Inventory procedure for Level II (Reconnaissance) surveys (USDA FS 1992 and PNF 2002). The inventory characterizes riparian areas using channel morphological features, identifies vegetative community types, determines the existing ecological condition and trend (including Rosgen Stream Type and Pfankuch Channel Stability), and identifies Watershed Improvement Needs (WIN). Channel stability ratings were compared to 1970 stream survey ratings to determine trend (Thompson et al 1973).

Boulder Creek

Streams in the Boulder Creek subwatershed were surveyed in 1991-1993, and 1996 (PNF 1997). Identified areas of concern from those surveys were revisited in 2000. Five percent of the surveyed streams were in poor condition, 30 percent were in fair condition, and 65 percent were in good condition, based on Pfankuch Channel Stability ratings (Pfankuch 1975). Boulder Creek is a 4th order, generally cobble channel, with fair to good channel stability, and a gradient of two to four percent. The lower elevations of Boulder Creek were affected by the 1997 rain-on-snow flood event with some reaches now in poor stability condition (below Squirrel and Hillman Creeks).

Tributaries to Boulder Creek are steeper (15-25 percent gradients), with more boulder type channels. Channel stability ranges from poor to good. Poor channel stability was found in Pollock and Squirrel Creeks. The 1990 streams surveys also found streams reaches in poor condition due to heavy sheep grazing (Thompson, et al., p. 30).

Lost Creek

Streams in upper Lost Creek were surveyed in 2003 (PNF 2003). Of the surveyed streams in Lost Creek, 37 percent rated good, 25 percent rated fair, and 38 percent rated fair trending towards poor channel stability. Of the surveyed streams in East Fork Lost Creek, 19 percent rated good, 37 percent rated fair, and 44 percent rated fair-poor. Most impacts to channel stability here were due to sheep and cattle grazing. Compared to 1971 stream condition surveys, downward trends were observed in the East Fork Lost Creek in lower Butter Gulch and its north tributaries, and the mainstem of East Fork Lost Creek above its confluence with Butter Gulch; in Upper Lost Creek, downward trends were observed in the mainstem in reaches in the middle section, and two other tributaries. The mainstem of Upper Lost Creek and East Fork Lost Creek are rated fair for channel stability. The lower portion of East Fork Lost Creek had fair and fair-poor stability. The large west tributary of Butter Gulch was in fair condition with Rosgen Stream types ranging from B4 to B4a and B3. Two areas were fair-poor condition. Both are the lower sections of tributaries from the north to Butter Gulch that were surveyed as Rosgen stream type C4b, a sensitive to disturbance stream type.

Over 20 miles of perennial stream and 7 miles of intermittent stream were surveyed in 1994 in Lost Valley Reservoir and Lower Lost Creek (PNF 1994). The channel stability of the 12+ miles of stream surveyed in the Lost Valley Reservoir area was good in 5.6 miles (45 percent), fair in 2.9 miles (24 percent), and poor in 3.75 miles (30 percent). The poor condition stream sections were mostly finer substrate (sand and gravel) that are very sensitive to disturbance. The reservoir is a high density recreation area with patches of private lands and cattle grazing issues. The inlet to the reservoir is in fair-poor condition. The Slaughterhouse Gulch east tributary (B5/C5 RST) is in fair to poor condition. Six tributaries flow into the

reservoir on the west side. Two perennial streams are in fair-poor condition with fine grained channels (B5 and C4 RSTs). In Lower Lost Creek, channel stability of the 15.5 miles of stream surveyed was good in 8.6 miles (55 percent) and fair in 6.9 miles (45 percent). The mainstem was composed of B3 and B4 RSTs in good condition. One B3c RST section had serious grazing effects around 4400 feet in elevation. Bear Gulch, an east tributary, was in fair-good condition (B3a, A2a, and A3 RSTs). North tributaries in lower Lost Creek include Rough Creek (A2a RST in good-fair condition) and Finn Creek (A3a RST in fair-poor condition).

Upper Weiser River

The East (31 miles) and West Branch (16 miles) of the Weiser River were surveyed in 1994 and 2000 (PNF 2000). Stream channel stability was assessed on 77 percent of the East Branch (24.2 miles), and 47 percent of the West Branch (7.6 miles). About half the stream channels were stable (stability rated good-fair) and half were unstable (stability rate fair-poor or poor). Most of the 1994/2000 fair-poor and poor rated sections of stream were also identified as impacted in 1970 surveys. A number of stream sections rated good in 1970 had decreased in stability. Both cattle and sheep grazing impacts (10 identified grazing areas of concern), and roading impacts (13 road areas of concern identified) affect stream channel stability in the East Branch and West Branch.

In the East Branch, channel stability was good in 49 percent, fair in 7 percent, fair-poor in 41 percent, and poor in three percent of surveyed stream miles. Stability in vulnerable, fine-grained stream types (Rosgen types C4, F4, E4 and E5) rated fair to poor along two miles of the mainstem. The channel was downcut in lowest elevations. Adjacent tributaries (mostly Rosgen types B4 and B3) were also in fair to poor condition. A tributary to the East Branch was rated fair to poor due to effects of long-term grazing and water diversion (Yantis Ditch). In the West Branch, channel stability was rated good in 42 percent, fair in 55 percent, and poor in 3percent of surveyed streams. The mainstem and steeper tributaries were stable channels. The more vulnerable, fine grained lower channels (Rosgen type B4c, B4, and C4) and was in poor condition.

West Fork Weiser River

Riparian surveys were conducted in upper WFW in1992 and 1994 (PNF 1996), and in 2004 in lower WFW (PNF 2004). Tributaries include Grouse, Fourth of July and Rock, Sheep and Corral Creek. The 1970 stream survey in this area noted that “extremely heavy use by livestock in alluvial bottom...and…on livestock driveways…has resulted in deterioration of the adjacent stream channels to poor or fair condition” (Thompson et al, 1973). Of the 40 miles surveyed in 1996, stability rated good in 39 percent, fair in 50 percent and poor in 11 percent of stream channels. When 1994 survey ratings were compared to 1970 stability ratings, only one unstable stream reach was found to improve. In all other comparable reaches, channel stability had remained or deteriorated further to fair or poor condition.

The Lower West Fork Weiser River and Rocky Gulch had fair to good channel stability ratings. The mainstem of the West Fork Weiser River is moderately entrenched with good channel stability.

Wetlands and Floodplains

The goal of Executive Order 11988 is that proposed activities must not increase flood hazards and must preserve the resource benefit of floodplains (ability to dissipate flood flows and moderate flood peaks.) The goal of Executive Order 11990 is that proposed activities must preserve resource benefits of wetlands (ability to produce abundant and diverse biota, buffer water quality, and recharge groundwater).

Riparian areas in the analysis area are predominantly associated with streams, wetlands or spring areas. The National Wetlands Inventory (NWI) maps approximately 1200 acres within the project area. Two main types of wetlands are found in the project area, riverine and palustrine (USDI Fish and Wildlife Service 1979). Riverine wetlands, located along perennial stream channels, are described as Freshwater Forested/Shrub wetlands that follow river and stream floodplains. These areas provide travel corridors and habitat for fish, bird, and mammal species. A map of the Federal Wetlands Inventory for the analysis area can be found in the planning record in addition to riparian mapping of streams, wetlands, and springs described in the previous section. Existing roads affect floodplains along streams and at stream crossing locations. Some of these sites constrict the channel or affect channel geometry, which indirectly affects wetlands and floodplains.

Beneficial Uses and the Approved Total Maximum Daily Load (TMDL) for West Fork of the Weiser River

A designated use is a beneficial use assigned to a specific water body. The Clean Water Act (CWA) requires Idaho to recognize existing uses, which are uses that are actually attained in a water body on or after November 28, 1975, whether or not they are designated uses. Idaho presumes most undesignated waters will support cold water aquatic life and either primary or secondary contact recreation. These are termed presumed uses. Designated, existing, and presumed uses must all be protected. Waterbodies within the project area are undesignated except for the West Fork of the Weiser River, which is designated for cold water biota, salmonid spawning, primary contact recreation, and domestic water supply.

In designating uses, the state of Idaho takes into consideration the use and value of the water body for public water supply; for protection of fish, shellfish, and wildlife; and for recreational, agricultural, industrial, and navigational purposes. While there may be competing beneficial uses in a river or a stream, federal law requires Department of Environmental Quality (DEQ) to protect the most sensitive of the beneficial uses.

Beneficial uses within the analysis area include cold water aquatic life, and contact recreation (IAC 2010). Idaho water quality standards require that surface waters of the state be protected for beneficial uses, wherever attainable (IDAPA 58.01.02.050.02).

The West Fork of the Weiser has a TMDL in place published in June of 2006 for temperature. All the other waterbodies within the analysis area are recognized in the Final 2010 305(b) Integrated Report as Fully Supporting or not accessed (IDEQ 2011a).

The temperature TMDL developed for the Weiser River by IDEQ established potential natural vegetation (PNV) targets for several stream segments within the Weiser River subbasin. PNV is a surrogate measure for temperature and assumes that shading of the stream channel reduces solar loading to the stream, thereby reducing the temperature of the water. PNV essentially refers to an intact and mature riparian plant community with little, if any, anthropogenic disturbance. For the Weiser temperature TMDL, five types of general riparian communities were identified and used to determine PNV for the stream segments. The five types include:

> 1) Mixed conifer: vegetation type at the upper headwaters where denser stands of subalpine fir, Douglas fir, grand fir, and ponderosa pine occur

2) Conifer/meadow: vegetation type where tree density is more open; shrub and grass meadows may occupy thin areas along streambanks with conifers in the nearby overstory

3) Grass meadow: community on wide open meadows where conifers and shrubs tend to be absent or much reduced

4) Cottonwood/conifer mix: community that occurs in the area above and below Starkey where a transition occurs between the conifer zone and the cottonwood/shrub community

5) Cottonwood/shrub: community where cottonwood trees dominate an understory of mixed deciduous shrubs

The PNV shade targets and the previously mentioned community types were applied not only to the five 303(d) listed temperature segments within the subbasin, but also to several other non-listed stream segments in the subbasin. The rationale for IDEQ applying this "watershed approach" to develop the PNV targets was to address the impacts that non-listed segments may have on water temperature in listed segments when confluences occur between them.

As a result of this watershed approach, the temperature TMDL addendum includes a loading analysis for the five 303(d) listed tributaries, as well as the Weiser River and ten of its major tributaries. Excess solar loads, based upon perceived existing vegetation/shade, for all of the West Fork of the Weiser and the percent reduction relative to the segment's total load are summarized in Table WS-7.

According to the temperature TMDL, the streams segments that require less than a 20 percent reduction are in good condition and are considered in less need of treatment. Using similar rationale, while also incorporating excess load ranking (ranking of waterbodies from 1 to 21 by excess solar load); the priority stream segments for implementation are divided into the following categories:

1) Tier 1 – (excess load ranking 1-7 and greater than 20 percent reduction)

2) Tier 2 – (excess load ranking 1-7 and less than 20 percent reduction, or excess load ranking 8-14 and greater than 20 percent reduction)

3) Tier 3 – (excess load ranking 8-14 and less than 20 percent reduction, or excess load ranking 15-21)

The West Fork of the Weiser is recognized as a Tier 2 Water Body.

Table WS-7. Temperature Load for the West Fork of the Weiser River (2010 IDEQ).

Water Body	Excess Load (kWh/day)*	Excess Load Rank	Percentage Reduction	Tier
West Fork Weiser River	-131,201	14	27%	2

*Kilowatts per day.

The TMDL process is the responsibility of the State to design, and the Forest Service to implement and monitor. The TMDL includes specific restoration and monitoring requirements, including on Federal lands. Management activities may continue as long as BMPs are applied and subsequent monitoring is implemented (IDEQ 2008b).

Compliance with the implementation plan for the West Fork of the Weiser River TMDL (IDEQ 2013) and the CWA is achieved through the proper site-specific design, implementation and monitoring of Best

Management Practices (BMPs). BMPs are practices approved by the State and the Environmental Protection Agency (EPA) that are intended to result in compliance with State water quality standards for nonpoint source pollution.

Implementation of Forest Plan Standards and timber harvest BMPs are key elements of the proposed action and all alternatives. A key concept of BMPs is that if monitoring identifies noncompliance with State water quality standards, then the Forest Service is obligated to restore compliance. As long as BMPs have been applied and monitoring and necessary adjustments are ongoing, then the Forest Service is in compliance with the CWA (IDEQ 2008a).

Summary of Existing Condition

There are currently about 640 miles of road within the analysis area for this project. The road density is ranges within the subwatersheds from 1.0 mile to 8.5 miles per square mile. A total of 176 miles of open and closed road are located within RCAs, which may also be contributing to a decrease in floodplain connectivity.

The primary source of accelerated sediment is roads as most past harvest has enough vegetative and ground cover to reduce surface runoff and erosion to pre-harvest levels. The BOISED model predicts that in 2013 the analysis area will produce approximately 5 to 23 percent over natural sediment yield (Table WS-2) for the subwatersheds within the analysis area.

The current ECA for the subdrainages within the analysis area is as much as 55 percent. Currently, 28 drainages have an ECA in the high category (over 25 percent) where increases in peak flows may occur (Haupt 1967; Stednick 1996; Megahan and Hornbeck 2000). The East and West Branch of the Weiser, East Fork Lost Creek and Lost Creek also have an ECA above 25 percent. Most of the mainstem streams in the analysis area are in fair to good condition. Some tributaries are in fair to poor condition. The 1971 channel inventory identified several streams in the drainage as fair (USDA Forest Service 1996). See Tables WS-3 through WS-6 for the ECA and CCR of all drainages and subwatersheds analyzed.

The West Fork of the Weiser River has a TMDL in place for temperature. All other waterbodies in the project were not assessed or found to be fully supporting beneficial uses.

Watershed Restoration Objectives

One of the objectives for the Lost Creek -Boulder Creek Project is to move all subwatersheds within the project area toward the desired condition for soil, water, riparian, and aquatic resources and improve the Boulder Creek subwatershed from Condition Class 3 to Condition Class 2 as described in the Watershed Condition Framework, with an emphasis on:

a. Restoring habitat connectivity, especially in streams occupied by Endangered Species Act (ESA)-listed fishes and in designated critical habitat (DCH) as measured by:
    - The number of crossings removed or replaced to specifically improve fish passage

b. Reducing road-related accelerated sediment and other road related impacts as measured by:
    - Road density/location by subwatershed
    - Stream miles improved-includes miles of fish habitat re-connected and miles of stream enhanced through road decommissioning and other treatments

3.3.4 Direct and Indirect Environmental Effects

The analysis area for direct and indirect effects includes the on- and off- Forest portions of Boulder Creek, a tributary to the Little Salmon River, the Upper Weiser River, and the West Fork of the Weiser River, including Lost Creek, a major tributary from the east. See Table WS-8 for a list of issues and indicators used in the environmental effects analysis.

Table WS-8. Issues and Indicators used in Watershed Analysis.

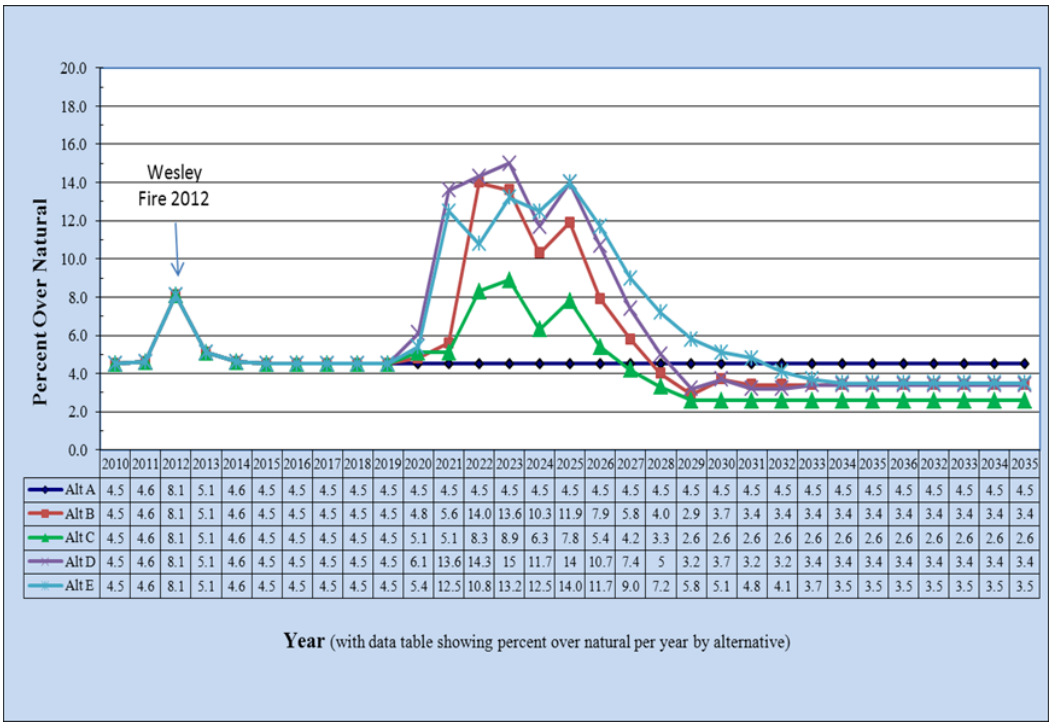
Issue	Indicators
Issue 2: Watershed conditions and sediment rates may be altered due to the proposed activities for roads vegetative treatments, and prescribed fire within the analysis area.	• Maximum percent over natural sediment yield (Boulder Creek only - BOISED Model output) • Cumulative net difference in sediment yield over 10 years (Boulder Creek only - BOISED Model output) • Total miles of system road decommissioning that achieve long-term soil productivity and hydrologic function (obliteration) • Total miles of unauthorized route treatments that achieve long-term soil productivity and hydrologic function (obliteration) • Miles of system road decommissioning that achieve long-term soil productivity and hydrologic function (obliteration) within RCAs
Issue 3. The number of roads selected for the MRS and their maintenance level and location will affect sediment rates and long term watershed functionality.	• Total road miles (system and unauthorized routes) by subwatershed and maintenance level • Total road density (system and unauthorized routes) by subwatershed • Long-term annual percent over natural sediment yield (Boulder Creek only - BOISED Model output)
Issue 4: Proposed activities may change timing and duration of peak runoff and increase bank instability in sensitive stream channels.	• Number of drainages where there is an increase in the Channel Condition Risk • Number of drainages that are over 25 percent ECA (High Category)
Issue 5: Mechanical vegetation treatments in RCAs may negatively affect sediment delivery, stream temperatures and LWD.	• Acres of RCA vegetation treatments (Analyzed in Fisheries Section) • Acres of treatment within one site potential tree height (Analyzed in Fisheries Section)

Indicators for determining effects within RCAs from proposed vegetation treatments was not completed for the DEIS. Site-specific data needed to input into the WEPP model was not collected prior to the release of this DEIS and therefore the sediment delivery distances are not calculated in this document. Site-specific data will be collected, and results of the WEPP Analysis are planned for release in the FEIS.

Boulder Creek was modeled using the BOISED model to analyze differences between alternatives for the percent over natural sediment induced by the proposed project activities.

Drainages and subdrainages within the analysis area were analyzed for changes to peak flows by evaluating the ECA and CRR.

Figure WS-8 shows the percent over natural sediment estimated by the BOISED model for Boulder Creek. Table WS-10 displays the ECA percentage for those drainages rated High and Very High by alternative. Table WS-11 summarizes the indicators by subwatershed and alternative at the end of this section.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2032	2033	2034	2035
Alt A	4.5	4.6	8.1	5.1	4.6	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Alt B	4.5	4.6	8.1	5.1	4.6	4.5	4.5	4.5	4.5	4.5	4.8	5.6	14.0	13.6	10.3	11.9	7.9	5.8	4.0	2.9	3.7	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Alt C	4.5	4.6	8.1	5.1	4.6	4.5	4.5	4.5	4.5	4.5	5.1	5.1	8.3	8.9	6.3	7.8	5.4	4.2	3.3	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Alt D	4.5	4.6	8.1	5.1	4.6	4.5	4.5	4.5	4.5	4.5	6.1	13.6	14.3	15	11.7	14	10.7	7.4	5	3.2	3.7	3.2	3.2	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Alt E	4.5	4.6	8.1	5.1	4.6	4.5	4.5	4.5	4.5	4.5	5.4	12.5	10.8	13.2	12.5	14.0	11.7	9.0	7.2	5.8	5.1	4.8	4.1	3.7	3.5	3.5	3.5	3.5	3.5	3.5	3.5

Figure WS-3. Boulder Creek – Annual Percent over Natural Sediment Yield over 25 years by Alternative Estimated by the BOISED Sediment Model.

Table WS- 9. Miles of System Road by subwatershed and Maintenance Level.

Subwatershed	Alt A			Alt B			Alt C			Alt D			Alt E		
	Maintenance Level			Maintenance Level			Maintenance Level			Maintenance Level			Maintenance Level		
	1	2	3/4	1	2	3/4	1	2	3/4	1	2	3/4	1	2	3/4
Boulder Creek	49	23	20	20	22	20	1	12	20	21	20	20	21	22	20
Lost Creek	39	102	42	27	93	42	24	91	42	27	93	42	27	102	42
Upper Weiser River	16	44	17	12	38	17	10	31	15	12	39	17	12	44	17
Upper West Fork Weiser River	31	70	13	25	67	13	19	60	11	25	67	13	25	70	13
Lower West Fork Weiser River	0	5	2	0	5	2	0	3	2	0	5	2	0	5	2
Totals	135	244	94	84	225	94	54	197	90	85	226	94	85	243	94
Total System Roads	473			404			341			404			422		

Table WS-10. Drainages at or moved to above 25 percent ECA in the Analysis Area.

Drainage Name		ECA-Existing	ECA Rating-Existing	ECA Alt B	ECA Alt C	ECA Alt D	ECA Alt E
Boulder Creek	Huckleberry Creek	35%	High	36%	35%	37%	37%
	Ant Basin Creek	27%	High	27%	27%	28%	28%
	Cold Springs Creek	35%	High	35%	35%	35%	35%
	Star Creek	25%	Moderate	25%	25%	26%	25%
Lost Creek	Headwaters Lost Creek	29%	High	33%	31%	34%	34%
	Upper E.F. Lost Creek	37%	High	41%	39%	43%	43%
	Butter Gulch	32%	High	34%	33%	37%	36%
	Tributary 2A to E.F. Lost Creek	39%	High	40%	39%	46%	46%
	Bear Gulch	47%	Very High	48%	47%	48%	48%
Upper Weiser River	Yantis Ditch	26%	High	30%	29%	33%	33%
	Tributary 2 to East Branch	47%	Very High	48%	47%	48%	48%
	Tributary 4 to East Branch	22%	Moderate	25%	25%	26%	26%
	Tributary 5 to East Branch	42%	Very High	48%	51%	49%	49%
	Tributary 6 to East Branch	45%	Very High	50%	50%	50%	47%
	Tributary 7 to East Branch	48%	Very High	50%	50%	50%	50%
	Upper West Branch Weiser River	28%	High	30%	29%	32%	32%
	Tributary 2 to West Branch	20%	Moderate	31%	22%	34%	22%
Upper WFWR	Headwaters of WFWR	19%	Moderate	24%	21%	26%	26%
	Sheep Creek	46%	Very High	50%	49%	52%	51%
	Grouse Creek	22%	Moderate	25%	23%	27%	27%
	Rock Creek	26%	High	27%	27%	28%	28%

ECA < 5% is Very Low; 5-15% is Low; 15-25% is Moderate; 25-40% is High; and >40% is Very High.

Alternative A

Alternative A (the no action alternative), would propose no vegetation or watershed restoration treatments. Erosion from existing roads within the analysis area would continue at current levels, and be the primary ongoing source of management-induced sediment delivery to streams. The 2.8 miles decommissioning for East Fork Lost Creek NIDGS Habitat Improvement Project is planned to occur in 2013 and result in a decrease in sediment yield levels within the East Fork of Lost Creek. The recently completed vegetation treatments and prescribed fire acres still planned under the East Fork Lost Creek NIDGS Habitat Improvement Project (which would likely occur over the next 5 to 10 years), result in a short-term increases in sediment yield levels. The road obliteration results in a decrease over the long term in estimated percent over natural sediment for the East Fork of Lost Creek drainage. The Wesley Fire affects sediment rates in Boulder Creek and Lost Creek. Sediment rates are estimated to be elevated from 2012 to approximately 2015.

For Alternative A (No Action) total road density would remain at current levels within the analysis area (WS-Table 11). Roads would not incur increased use as haul routes. No additional maintenance would

occur beyond that normally scheduled. No stream crossings would be removed or improved. The MRS would remain as all the roads currently included on the Forest System network for each subwatershed.

No increase to ECA/Channel Condition Risk would occur and therefore no change to timing or duration of peak runoff would occur as a result of this project. Sixteen drainages are currently greater than 25 percent ECA. Of those 16 drainages, six are greater than 40 percent ECA (Very High Category). Eleven drainages currently have a Channel Condition Rating (CCR)of High based on ECA, sensitivity to disturbance, and documented channel stability conditions.

Tables WS-3 through WS-6 show the existing condition ECA percentages for all drainages. Over time as past harvest treatment areas mature and re-grow, all ECA levels will generally slowly decrease. However, high severity wildfire, windthrow, insects, or other natural events can also affect ECA levels.

Alternative B

Alternative B (Proposed Action) proposes approximately 40,000 acres of vegetation treatments and 45,000 acres of prescribed fire. Alternative B would decommission 70 miles of FS System road and 90 miles of unauthorized routes. Approximately 32 miles are located in RCAs. This would reduce road-related sediment that is generated from road prisms (travelway, cut and fill) of roads currently on the landscape. Almost all of these roads are closed to the public and many have erosional issues due to overdue maintenance. Decommissioning of roads reduces the overall road density in all the subwatersheds within the analysis area (Table WS-11). In all alternatives road treatments would create a slight temporary to short-term sediment increase but ultimately reduce long-term sediment production. Recreation and range access where needs are identified would be maintained.

Additional reductions in road-related erosion issues are addressed by 60 miles of new long-term closures. These are currently closed Level 2 system roads that have generally not been maintained and where road surveys show many erosion issues are present. The long term closure treatment would move them to Maintenance Level 1 and perform stabilization treatments such as; removal of culverts, outsloping, waterbarring, and scarification/seeding of travelways to provide groundcover. Twenty-nine miles of temporary roads are proposed in this alternative. All temporary routes would be decommissioned (fully obliterated) after use and stabilized during winter and spring months.

The BOISED model was used to estimate sediment yield levels for the Boulder Creek subwatershed. Sedimentation above natural rates is currently occurring due to existing roads, recent timber harvest (Boulder Thin Timber Sale) and the Wesley Fire in 2012. BOISED estimates sediment yields resulting from the proposed activities would increase to a maximum of 14 percent over natural. Figure WS-3 displays the BOISED results for Boulder Creek and the percent over natural for each year over 25 years. The total cumulative difference in sediment from the existing condition would result in approximately 52 percent increase over a 15 year period for Alternative B. The total cumulative difference over 15 years is an estimate for sediment yield produced cumulatively over 15 years. It provides a means to capture the effects on sediment yield over the short-term time frame (3 to 15 years) from the project activities that are proposed to take place over several years. Prescribed burning occurs over several years after the harvest, which elevates the sediment yield in the short term.

For all the action alternatives much of the vegetation treatments propose thinning removing less than 20 percent of the crown cover which would have no effect on ECA. Prescribed burning proposed in all action alternatives does not affect the ECA because it is not expected to remove more than 20 percent of the

existing crown cover. Some logging prescriptions (patch cuts and shelterwood) do propose activities that would result in increases to ECA. For Tributary 2 of the West Branch of the Weiser River, ECA is moved from 20 (Moderate) to 31 percent (High), which moves this drainage into the High category for CCR. The one additional drainage brings the total to 17 subdrainages where the ECA would be higher than 25 percent.

Channel Condition Rating indicates which drainages may have compromised resiliency for channel stability with increased peak flows. Under Alternative B there are 8 drainages that:

- Have a proposed increase to the amount ECA,
- Are rated High or Very High for existing ECA,
- Are rated High for CCR,
- Are surveyed as sensitive channel types (Rosgen 1996), and/or have been surveyed as in Fair or Poor condition for stream bank stability.

These 8 drainages likely have reduced resiliency to withstand peak flows and are at risk for increased peak flows, due to the removal of crown cover in the drainage.

- Yantis Ditch Tributary
- Tributary 4 to East Branch of the Weiser River
- Tributary 5 to East Branch of the Weiser River
- Tributary 7 to East Branch of the Weiser River
- Upper East Branch of the Weiser River
- Intermittent Tributary to the West Branch of the Weiser River
- Sheep Creek (WFWR)
- Headwaters of Lost Creek

Alternative C

Alternative C proposes approximately 36,500 acres of vegetation treatments and 45,000 acres of prescribed fire. Alternative C would decommission 132 miles of FS System road and 117 of unauthorized routes. Approximately 48 miles are located in RCAs. In this alternative no patch cuts would occur nor would any commercial harvest within RCAs.

This alternative would reduce road-related sediment that is generated from road prisms (travelway, cut and fill) of roads currently on the landscape more than any other alternative. Additional decommissioning of roads reduces the overall road density the most in all the subwatersheds within the analysis area (Table WS-11). Eleven miles of temporary road are proposed in this alternative. All temporary routes would be decommissioned (fully obliterated) after use and stabilized during winter and spring months.

BOISED estimates sediment yields resulting from the proposed activities proposed in Alternative C would increase to a maximum of 8.9 percent over natural. Figure WS-3 displays the BOISED results for Boulder Creek and the percent over natural for each year over 25 years. The total cumulative difference in sediment

from the existing condition would result in approximately 8 percent increase over a 15 year period for Alternative C. Alternative C starts to shows more of a decrease after implementation in annual sediment produced than the other alternatives due to the increased road decommissioning proposed.

Vegetation treatments propose to increase the ECA in many tributaries, but not enough to move any additional tributaries to the High or Very High category for ECA or to the High category for CCR.

Channel Condition Rating indicates which drainages may have compromised resiliency for channel stability with increased peak flows. Under Alternative C there are 7 drainages that:

- Have a proposed increase to the amount ECA;
- Are rated High or Very High for existing ECA;
- Are rated High for CCR;
- Are surveyed as sensitive channel types (Rosgen 1996), and/or have been surveyed as in Fair or Poor condition for stream bank stability.

These 7 drainages likely have reduced resiliency to withstand peak flows and are at risk for increased peak flows, due to the removal of crown cover in the drainage.

- Yantis Ditch Tributary
- Tributary 5 to East Branch of the Weiser River
- Tributary 7 to East Branch of the Weiser River
- Upper East Branch of the Weiser River
- Intermittent Tributary to the West Branch of the Weiser River
- Sheep Creek (WFWR)
- Headwaters of Lost Creek

Alternative D

Alternative D proposes approximately 43,200 acres of vegetation treatments, 45,000 acres of prescribed fire. Alternative D would decommission 69 miles of FS System road and 90 of unauthorized routes. Approximately 32 miles are located in RCAs.

Decommissioning of roads reduces the overall road density similarly to Alternative B in all the subwatersheds within the analysis area (Table WS-11).

Reductions in road-related erosion issues are not addressed for the 60 miles of Maintenance Level 2 road currently closed the public. These are currently closed Level 2 system roads that have generally not been maintained and where road surveys show many erosion issues are present. No long term closure treatment would occur and they would remain as Maintenance Level 2 closed roads. Thirty-one miles of temporary road are proposed in this alternative. All temporary routes would be decommissioned (fully obliterated) after use and stabilized during winter and spring months.

BOISED estimates sediment yields resulting from the proposed activities proposed in Alternative D would increase to a maximum of 15 percent over natural. Figure WS-3 displays the BOISED results for Boulder Creek and the percent over natural for each year over 25 years. The total cumulative difference in sediment

from the existing condition would result in approximately 60 percent increase over a 15 year period for Alternative D.

For Alternative D vegetation treatments propose to increase the ECA to High for 5 additional drainages; Star Creek (Boulder Creek), Tributary 2 to the West Branch of the Weiser River, Tributary 4 of the East Branch of the Weiser River, the headwaters of the Upper West Fork Weiser River, and Grouse Creek (WFWR). The additional drainages bring the total to 21 drainages where the ECA would be higher than 25 percent. Two additional drainages would move into the high category for CCR, Tributary 2 to the West Branch of the Weiser River and Tributary 4 of the East Branch of the Weiser River.

Channel Condition Rating indicates which drainages may have compromised resiliency for channel stability with increased peak flows. Under Alternative D there are 9 drainages that:

- have a proposed increase to the amount ECA;
- are rated High or Very High for existing ECA;
- are rated High for CCR;
- are surveyed as sensitive channel types (Rosgen 1996), and/or have been surveyed as in Fair or Poor condition for stream bank stability.

These 9 drainages likely have reduced resiliency to withstand peak flows and are at risk for increased peak flows, due to the removal of crown cover in the drainage.

- Yantis Ditch Tributary
- Tributary 4 to East Branch of the Weiser River
- Tributary 5 to East Branch of the Weiser River
- Tributary 7 to East Branch of the Weiser River
- Tributary 2 to the West Branch of the Weiser River
- Upper East Branch of the Weiser River
- Intermittent Tributary to the West Branch of the Weiser River
- Sheep Creek (WFWR)
- Headwaters of Lost Creek

Alternative E

Alternative E proposes approximately 32,400 acres of vegetation treatments, 31,500 acres of prescribed fire. Alternative E would decommission 51 miles of FS System road and 90 of unauthorized routes. Approximately 22 miles are located in RCAs.

Decommissioning of roads reduces the overall road density similarly to Alternative B in all the subwatersheds within the analysis area (Table WS-11).

For the Maintenance Level 2 system roads that are closed to the public, no long term closure treatment would occur the same as for Alternative E. Thirty-one miles of temporary road are proposed in this alternative. All temporary routes would be decommissioned (fully obliterated) after use and stabilized during winter and spring months.

BOISED estimates sediment yields resulting from the proposed activities proposed in Alternative D would increase to a maximum of 14 percent over natural. Figure WS-3 displays the BOISED results for Boulder Creek and the percent over natural for each year over 25 years. The total cumulative difference in sediment from the existing condition would result in approximately 84 percent increase over a 15 year period for Alternative E.

For Alternative E vegetation treatments propose to increase the ECA into the High category for 3 drainages; Tributary 4 of the East Branch of the Weiser River, the Headwaters to the WFWR, and Grouse Creek (WFWR). The additional drainages bring the total to 19 drainages where the ECA would be higher than 25 percent . One additional drainage would move into the high category for CCR, Tributary 4 of the East Branch of the Weiser River.

Channel Condition Rating indicates which drainages may have compromised resiliency for channel stability with increased peak flows. Under Alternative E there are 8 drainages that:

- Have a proposed increase to the amount ECA;
- Are rated High or Very High for existing ECA;
- Are rated High for CCR;
- Are surveyed as sensitive channel types (Rosgen 1996), and/or have been surveyed as in Fair or Poor condition for stream bank stability.

These 8 drainages likely have reduced resiliency to withstand peak flows and are at risk for increased peak, due to the removal of crown cover in the drainage.

- Yantis Ditch Tributary
- Tributary 4 to East Branch of the Weiser River
- Tributary 5 to East Branch of the Weiser River
- Tributary 7 to East Branch of the Weiser River
- Upper East Branch of the Weiser River
- Intermittent Tributary to the West Branch of the Weiser River
- Sheep Creek (WFWR)
- Headwaters of Lost Creek

Alternative E proposed less prescribed fire than the other action alternatives. This would reduce the short-term sediment spike following prescribed burning.

Effects Common to Action Alternatives

Timber harvest within the analysis area has the potential to change erosion rates and sediment delivery to streams. The level of surface disturbance and erosion attributed to logging is dependent on several factors, including logging systems used and the steepness of slopes. Logging systems, ranked from most to least disturbance, are ground-based, cable, and helicopter yarding.

Logging systems proposed to accomplish vegetation treatments include helicopter, tractor, tractor/jammer, and skyline/cable. Prescriptions include shelterwood with reserve tree (30 to 60 percent crown cover

removal), commercial thin/free thin and free thin/mature plantation (15 to 50 percent crown cover removal), free thin/patch cut (20 to 50 percent crown cover removal) and non-commercial thin (5 to 20 percent crown cover removal).

Several units proposed have been identified as including some potentially landslide prone areas as identified by the SINMAP model (Pack et al 1998). A field review to identify landslide potential on the ground would be conducted during layout of the units. Design features would be implemented to reduce any management actions that could increase the hazard of failure. Removal of more than 20 percent of the crown cover would be avoided and retainment of ground cover would be required in areas identified as having landslide potential (Table 2-5 Project Design Features and Mitigation Measures). Road reconstruction or temporary roads located within or above landslide prone areas would be required to outslope and install proper drainage features to avoid concentrating water on the steeper areas below the road. Areas identified with landslide potential within stream buffers would not be treated. See Figure SP-3 in the Soil Specialists Report for a map of potential landslide prone areas.

Project Design Features for Soil and Water

The project design features include the designation of RCAs along all perennial and intermittent streams and wetlands according to Forest Plan guidelines, with the exception of specific treatments designed within the RCA. For all other units, all perennial and intermittent streams would be protected with a buffer of undisturbed vegetation of 240 feet wide and 120-foot, respectively. A 120-foot buffer would also protect wetlands. The RCA widths are based 2 site potential tree heights for potential vegetation within the project area. Site-potential tree heights are based on the dominant potential vegetation group (PVG) and used to calculate riparian protection zones.

Management requirements in addition to project design features which have been added to the project to further reduce the risk of sediment delivery via channelized and diffuse flows from disturbed areas such as landings, skid trails, and harvested acres, as well as from harvest-associated roads and decommissioned roads (Chapter 2, Tables 2-5 and Table 2-6). In accordance with the Forest Plan, landings would be located out of RCAs wherever possible. When skid trails or landings receive site specific approval by the hydrologist or fish biologist to be located in RCAs, they would be developed such that degrading effects to RCAs are mitigated.

Established RCA buffers may not totally protect streams from sediment produced on harvest units or skid trails in upslope areas or on reconstructed roads that is carried in channelized flows through culverts or through upland ephemeral channels (Belt et al. 1992). Studies in Idaho and elsewhere concluded 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 non-channelized sediment flow. RCAs would reduce, but not eliminate the risk of channelized sediment reaching streams (ibid).

Gravelling of road stream crossings and armoring ditch lines would occur to inhibit erosion on all roads that are identified as haul routes and that would remain on the system as open or seasonally open roads. Road sections would be graveled for the full extent of the contributing road surface, or within the RCA, whichever is greater.

Data collection was conducted in 2013 using the Geomorphic Roads Analysis and Inventory Package (GRAIP) (Cissel et al 2012) in the Boulder Creek subwatershed and some additional locations within the

project area to identify specific road related erosion issues. Targeted road maintenance is planned using the GRAIP results for in additional site-specific sediment improvements on roads.

Roads that will be used as haul routes then decommissioned or placed into long-term closure should have BMPs applied where identified as delivering sediment to stream channels. Mitigation measures may include, but are not limited to, graveling of road prism in RCAs, armoring ditch lines with pit run, and placing obstructions or constructing catch basins below culverts.

All roads identified as haul routes (including roads that will remain open and those identified to be decommissioned or placed in long-term closure) that cross streams occupied with Listed species or DCH (Boulder Creek subwatershed) should have BMPs applied to minimize sediment delivery to occupied and DCH. BMPs may include graveling stream crossings and armoring ditch lines up to the entire extent of the RCA if necessary, placing obstructions and/or rolling dips, installing silt fence, applying mulch and/or slash and seed to exposed soil, installation of silt fence and constructing catch basins below culverts. All silt fencing and other non-biodegradable materials should be removed when hauling is complete.

RCA Proposed Treatments (Excluded from Alternative C)

Within the West Fork of the Weiser, Lost Creek, and Upper Weiser River subwatersheds, approximately 1,600 acres (Alternative E) to 2,000 acres (Alternative D) of thinning is proposed within the outer half of the designated RCA. The Forest Plan standard SWST10 states that trees or snags that are felled within RCAs must be left unless determined not to be necessary for achieving soil, water, riparian, and aquatic desired conditions. Felled trees or snags left in RCAs shall be left intact unless resource protection (e.g., the risk of insect infestation is unacceptable) or public safety requires bucking them into smaller pieces (USFS 2003).

The determination of RCA widths must consider the various riparian functions and ecological processes that exert an influence on the adjacent aquatic and terrestrial environment. Integral to the success of proper management, is an understanding of riparian functions and ecological processes, and local knowledge of the site being managed. With field data in hand, design of an appropriate RCA width can focus on conservation of appropriately functioning processes and restoration of damaged processes of concern based on the existing conditions of the site, proposed activities, and issues at hand.

Megahan and Hornbeck (2000) state that a properly designed and managed riparian area can provide a variety of amenities, while protecting riparian functions and ecological processes and diversity of species composition. They further state that a properly designed and managed riparian area includes careful management of forests both within, and outside of the riparian area.

Spence et al. (1996) and Quigley and Arbelbide (1997) identify several important considerations when appropriately delineating and designing management activities within or affecting RCAs. These are as follows:

a) A stream requires predictable and near-natural energy and nutrient inputs.

b) Many plant and animal communities rely on streamside or wetland forests and vegetation for migratory or dispersion habitat.

c) Small streams are generally more affected by hillslope activities than are larger streams.

d) As adjacent slopes become steeper, the likelihood of disturbance resulting in discernable instream effects increases.

e) Riparian vegetation 1) provides shade to stream channels; 2) contributes large woody debris; 3) adds small organic matter; 4) stabilizes stream banks; 5) controls sediment inputs from surface erosion; 6) and regulates nutrient and pollutant inputs to streams.

Taking a functional approach to delineating an RCA by looking at "zones of influence" (Spence et al. 1996) allows the qualified specialist to focus on specific riparian functions where a relationship between those functions and RCA widths are known. The 'zone of influence' approach provides the qualified specialist a means to distinguish between those riparian functions and ecological processes potentially affected by the proposed actions and those that, regardless of the RCA delineation, the proposed actions will not impair. The functions and processes that would be unaffected by the proposed action, regardless of the RCA delineation, could then be dropped from further discussion. When defining the RCA through site-specific analysis this rationale should be documented.

The riparian functions and processes that may be affected by the proposed action(s) (given the existing conditions and associated issues) should then be addressed through the RCA delineation. In general, the riparian functions and ecological processes that should be considered during delineation of RCAs through site-specific analysis include (taken primarily from Spence et al. 1996):

- Stream Shading
- Large Woody Debris Recruitment
- Fine Organic Litter
- Bank Stabilization
- Sediment Control
- Nutrients and Other Dissolved Materials
- Riparian Microclimate and Productivity
- Wildlife Habitat
- Windthrow
- Importance of Small Streams
- Importance of Hillslope Steepness

Field surveys and use of the Disturbed WEPP Model would be used to predict the probability of erosion and sediment delivery. Soil type, local climate, slope, and vegetation are inputs to the model used to calculate probabilities of occurrence. If the model estimates that the RCA treatments would have some potential for erosion on the slope directly below the activity in a 10-year precipitation event, RCA treatments would be precluded. Project Design Features have been established (Chapter 2, Table 2-10) to reduce the potential for sedimentation, and loss of shade and LWD within the RCA. Site specific delineation identifies the appropriate functions and processes between upland terrestrial habitats and adjacent aquatic habitats (Forest Plan B-34). Factors to be considered in the site specific field surveys include:

- Slopes steeper than 35 percent for log yarding.
- Potential for full suspension of logs where slopes are greater than 25 percent.
- Percent ground cover for both the out and inner half of the RCA.
- Potential yarding over snow when and where possible.
- Mitigation after yarding operations are complete. Need for waterbars or other drainage features that would prevent routing of sediment to the stream and provide a minimum of 75 percent ground cover. (SWGU05 - Ground cover should be sufficient to prevent erosion from exceeding the range of soil erosion rates that are characteristic of the local soil type, landform, climate, and vegetation of the area, or the soil-loss tolerance.)
- Coarse Woody Debris (CWD) within the RCA meeting 15 tons/acre standard.
- Areas identified as LSP or floodplains.
- Areas affected by livestock where trailing, compaction and, reduced desired native vegetation has increased surface runoff and reduced ground cover.
- Avoiding burning of slash piles within RCAs. The use of slash to achieve post-treatment groundcover and using broadcast burning for brush disposal.
- Retainment of any trees providing shade.

No trees providing shade to stream channels would be removed within the RCA and no treatments would occur within 120 feet for perennial streams or 60 feet for intermittent streams. Little to no sediment is expected to be contributed due to slope restriction and adequate ground cover requirements. No change in ECA (limited to 20 percent crown cover removal) would occur with the proposed RCA prescriptions. The total acres of RCA treatments proposed is likely to be reduced during the layout stage of the project as many will likely be within LSP areas or not meet the ground cover or slope requirements necessary to prevent sediment delivery to stream channels.

The proposed treatments within RCAs for Alternatives B, D and E, when implemented with the design features and Best Management Practices described above, are not expected to retard attainment of soil, water, riparian, and aquatic desired conditions.

Lost Valley Reservoir OHV Trail and Dispersed Camping

Alternative B, D, and E would designate approximately 13 miles of OHV trail that is currently seasonally open Forest System road and Level 1 closed Forest System road. Several short sections of non-system road would connect the trails to make loops. The trail tread would be approximately 74 inches wide with rolling erosion control dips installed and would be built to trail specifications required in the Forest Service Trails Handbook (FSH 2309.18 – Trails Management Handbook, Chapter 20 – Trail Development). These trails would be open to ATVs and UTVs. Erosion from the trail surface would be minimized by the application of rolling dips, water bars, and constructed crossings.

The construction of the connecting portions and reconstruction of the current existing roadbeds for use as an ATV/UTV trail would result in additional open motorized trail and associated sediment potential in the Lost Creek subwatershed when compared to the current condition of Level I closed road sections. This section is currently effectively closed with ground cover and vegetation over the road travelway. Road

decommissioning proposed in all action alternatives would result in a net reduction in all roads (closed and open) throughout Lost Creek. There would be a slight increase in the amount of roads open to motorized use under Alternative B, D, and E. Improvements on the west shore of Lost Valley Reservoir include the closure of approximately 12 dispersed camping sites and the improvement of approximately 68 existing dispersed camping sites. Approximately two miles of unauthorized routes will be blocked for motorized use and obliterated.

Post-Harvest Activities

Excavator piling activities for brush disposal and reforestation site preparation disturb forest litter and duff layers and expose soil to increased surface erosion. These activities have the potential for transporting additional sediment to streams. Site preparation (slash burning or broadcast burning) increases total sediment output temporarily until vegetation is established (USDI EPA 1980; USDA Forest Service 1979).

Action alternatives would include excavator piling with design features such as soil moisture limits, designated skid trails, and minimizing ground disturbance. Perennial and intermittent streams would have RCA buffers applied between the post-harvest activities and stream courses. Perennial streams would have a minimum of 240-foot buffer between the activity and the stream and intermittent channels would have buffers of 120 feet of undisturbed vegetation. These design features would decrease the likelihood of disturbance to soils and resulting sediment delivery to streams from both pile burning and excavator piling activities.

Prescribed Fire

Broadcast burning for slash disposal would occur on the vegetation acres treated in each alternative. Additionally, prescribed fire is proposed to reduce fuel loading on 45,000 to 31,500 additional acres depending on alternative. It is estimated that the majority of prescribed fire would result in low soil severity. The amount of fire that would actually occur in any given year depends on many factors which allow a burn “window” for implementation. Therefore, the amount of sediment generated may vary by year, but is estimated that burning would have effects over about 4 years post-treatment for the range of alternatives.

The main concern with prescribed fire is the increased potential for surface erosion due to duff reduction and subsequent mineral soil exposure. There is a curvilinear relationship between duff reduction and mineral soil exposure, with mineral soil exposure increasing with increasing duff consumption (Sandberg 1980). Prescribed burn operations attempt to leave sites with the surface condition of a low-severity burn. However, some of the areas (especially burn piles) often experience surface conditions associated with a high-severity burn that may result in hydrophobic or water repellent conditions. Greater runoff rates have been documented from the high-severity areas especially in the initial stages of the first rainfall event (Robichaud 1999). With increasing duff and litter moisture content, soil temperatures are reduced, preventing soil hydrophobicity and reducing surface erosion (Robichaud and Waldrop 1994). Recommended design features for adequate duff and soil moisture during prescribed burns and remaining bare ground soil exposure are well documented (Kalabokidid and Wakimoto 1992; USDA Forest Service 1980). Burn plan prescriptions would include objectives to meet duff consumption and mineral soil exposure.

Prescribed Fire within RCAs

There is prescribed fire treatment within RCAs with the objective of making the upland vegetation located within RCAs more defensible in the event of a wildfire. Approximately 25 percent of the total acres of RCA within the treatment area may actually receive fire and ladder fuel treatments. The ladder fuel treatment proposed includes hand pruning and limbing of ladder fuels in the understory, which will be lopped and scattered. Design features to protect the soil, water, riparian, and aquatic conditions include;

- Piling and burning of slash will be avoided in the RCA. If necessary to pile, burn piles will be constructed 120' from stream channels. Forest Plan CWD and snag standards would be met and no commercial harvest will occur.
- No pruning, thinning, or fire ignition will occur within 120 (perennial) and 60 (intermittent) feet of streams.
- No mechanical harvest, activities would be limited to hand tools and chainsaws to reduce canopy closure. This would mostly involve thinning from below and tree limbing. Trees greater than 6" DBH would be limbed to approximately eight feet above the ground. No alteration of the overstory is expected.
- Fire in RCAs would be managed to limit fire effects to low severity, retaining ground cover and shade providing vegetation. Fire intensity will be controlled by evaluation of duff moisture and fuel moisture conditions prior to ignition.
- Construction of fireline would be avoided within RCAs. No mechanical fire line may be constructed within RCAs. If fireline is needed, removing just brush within RCAs is preferred over the removal of all vegetation down to mineral soil. Fireline will be rehabilitated as soon as possible after use by pulling duff and groundcover back over mineral soil exposed. Waterbars and other measures to prevent surface erosion should be employed where necessary.
- Use of hose lays and raking of duff instead of disturbance of mineral soil would be utilized. If necessary to construct fireline, rehabilitation would occur promptly after prescribed burning activities, and consist of pulling back duff and woody debris to original conditions.

Guideline FMGU06 states; "Direct ignition of prescribed fire in RCAs should not be used unless site/project scale effects analysis demonstrates that it would not retard attainment of soil, water, riparian, and aquatic desired conditions." The proposed treatments within RCAs, when implemented with the above design features, are not expected to retard attainment of soil, water, riparian, and aquatic desired conditions. Less fireline (ground disturbance and loss of ground cover) is expected to be constructed with the additional flexibility to ignite within RCAs.

Prescribed fire would be allowed to back into RCAs and may be ignited within RCAs. Prescribed fire would have the potential to result in sediment delivery, although the project design features to retain ground cover and limit the burn to low severity would be minimize this risk. Burning is not expected to have adverse effects to water quality.

Wetlands and Floodplains

The Forest Plan standards protect streams and wetlands in RCAs so riparian dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. These areas help to maintain the integrity of aquatic ecosystems.

Existing roads would continue to affect floodplains along streams and at stream crossing locations. Some of these sites constrict the floodplain and change channel geometry, which directly affects wetlands and floodplains.

The proposed alternatives propose to decommission 23 to 48 miles of road in RCAs which includes the area near floodplains. Removal of these roads will improve floodplain function and benefit riparian dependent species. Riparian buffers around wetlands and streams (and their associated floodplains) would be delineated to exclude harvest maintaining the function and value of these areas.

Prescribed fire proposed within the analysis area may affect several first and second order tributaries. Forest Plan standards state that RCAs may be based on flood-prone width or two site-potential tree heights, whichever is greatest. The potential natural vegetation data for this location determines the RCAs to be at least 240 feet slope distance along perennial streams and 120 feet slope distance along intermittent streams. To adhere to these RCA standards, the following mitigation would be applied:

Some flood plains and wetlands may be lightly burned, but the effect should not be significant. Due to the season when burning would occur, the result is expected to be a patchy low severity fire. The flood plains and wetlands are expected to have minimal and insignificant effects to riparian vegetation, which would therefore retain ground cover and soil productivity.

For the action alternatives, direct and indirect effects to wetlands and floodplains would be minimized through the application of BMPs and designation of RCAs.

Table WS-11. Watershed Indicators for Direct and Indirect Effects – Comparison by Alternative

	Watershed Condition Indicator (WCI)	Watershed Indicator for Direct and Indirect Effects	ALT A	Alt B	Alt C	Alt D	Alt E
Boulder Creek	Sediment	Maximum percent over natural sediment (BOISED)	4.5	14.0	8.9	15.0	14.0
		Cumulative percent difference total sediment yield over 15 years (BOISED)	0	52	8	60	84
		Long-term Annual percent over natural sediment yield (BOISED)	4.5	3.4	2.6	3.4	3.5
	Road Density/Location RCAs Floodplain Connectivity	Total miles of system road decommissioned	0	30	60	30	29
		Total miles unauthorized routes treated	0	12	15	12	12
		Total road density (mi/sq mi)	3.1	2.0	1.1	2.0	2.0
		Miles of road decommissioned within RCAs	0	10.6	17.1	10.6	10.5
	Change in peak flow and/or base flows	Number of drainages where there is an increase in the Channel Condition Risk	0	0	0	0	0

		Number of drainages that are over 25 percent ECA (High Category)	3	3	3	4	3
Lost Creek	**Watershed Condition Indicator (WCI)**	**Watershed Indicator for Direct and Indirect Effects**	**ALT A**	**Alt B**	**Alt C**	**Alt D**	**Alt E**
	Road Density/Location RCAs Floodplain Connectivity	Total miles of system road decommissioned	0	21	26	21	12
		Total miles of unauthorized routes treated	0	40	51	40	40
		Total road density (mi/sq mi)	6.9	5.3	4.8	5.3	5.5
		Miles of road decommissioned within RCAs	0	5.9	6.1	5.9	4.1
	Change in peak flow and/or base flows	Number of drainages where there is an increase in the Channel Condition Risk	0	0	0	0	0
		Number of drainages that are over 25 percent ECA (High Category)	5	5	5	5	5

Upper Weiser River	**Watershed Condition Indicator (WCI)**	**Watershed Indicator for Direct and Indirect Effects**	**ALT A**	**Alt B**	**Alt C**	**Alt D**	**Alt E**
	Road Density/Location RCAs Floodplain Connectivity	Total miles of system road decommissioned	0	9	19	9	3
		Total miles of unauthorized routes treated	0	18	28	18	18
		Total road density (mi/sq mi)	4.7	3.6	2.8	3.6	3.8
		Miles of road decommissioned within RCAs	0	10.1	13.7	9.7	4.5
	Change in peak flow and/or base flows	Number of drainages where there is an increase in the Channel Condition Risk	0	1	0	2	1
		Number of drainages that are over 25 percent ECA (High Category)	6	7	6	8	7
Upper WFWR	**Watershed Condition Indicator (WCI)**	**Watershed Indicator for Direct and Indirect Effects**	**ALT A**	**Alt B**	**Alt C**	**Alt D**	**Alt E**
	Road Density/Location RCAs	Total miles of system road decommissioned	0	9	24	9	6
		Total miles of unauthorized route treated	0	20	22	20	20

	Floodplain Connectivity	Total road density (mi/sq mi)	8.5	6.8	5.8	6.8	7.0
		Miles of road decommissioned within RCAs	0	10.1	13.7	9.7	4.5
	Change in peak flow and/or base flows	Number of drainages where there is an increase in the Channel Condition Risk	0	0	0	0	0
		Number of drainages that are over 25 percent ECA (High Category)	2	2	2	4	4

Watershed Condition Framework

Many WCIs are considered to be functioning at risk within the analysis area. The reduction in road density by road decommissioning and obliteration moves the subwatersheds within the analysis area toward desired conditions to various degrees depending on Alternative. Watershed restoration is achieved to greater extent under Alternative C and to a lesser extent under Alternative E, due to the amount and effectiveness of restoration treatments proposed.

For Alternatives B, D, and E the amount of road decommissioning in Boulder Creek would reduce the road density from 3.1 to 2.0 miles per square mile. The improvements to fish passage, long-term soil productivity, road density in RCAs, assist to reclassify the subwatershed as Class 2 Functioning at Risk (previously Class 3 – Functioning at Unacceptable Risk). The following constitutes an essential project list for restoration activities to be implemented within the Boulder Creek subwatershed to move it from Condition Class 3 – Impaired Function to Condition Class 2 – Functioning at Risk.

- Road decommissioning to reduce the road density to Functioning at Risk levels as defined for Road Density/Location WCI under the PNF LRMP Appendix B. (0.7 to 1.7 miles per square mile)
- Road surfacing for open roads and roads used as haul routes through RCAs.
- Overdue road maintenance conducted for all system roads that are not effectively treated with long term closure.
- Implementation of effect long term closure treatments for all existing or new Maintenance Level 1.
- Obliteration of the lower Ant Basin Road Trailhead and Trail 324. Reconstruction of Forest System Road 51254.
- Trail maintenance on FS Trail 519 to repair burned waterbars, drainage features, etc. and improvements as described in the recreation section.
- The improvement of 16 fish passage barriers.

Under Alternative C, road density would be reduced to 1.1 miles per square mile, which would move Boulder Creek further toward the Class 1 – Functioning Appropriately rating. The Forest Plan WCI states that less than 0.7 miles per square mile is Functioning Appropriately for road density. The location of an

important main public access road in Boulder Creek (FS 50074) is located within the RCA. The Travel Analysis Plan recommends maintaining this route as a Maintenance Level 3 forest road.

Best Management Practices (BMPs)

Compliance with the Clean Water Act (CWA) is achieved through the proper site-specific design, implementation and monitoring of Best Management Practices (BMPs). BMPs are practices approved by the State and the Environmental Protection Agency (EPA) that are intended to result in compliance with State water quality standards for nonpoint pollution. Timber harvest practices identified by EPA include measures to protect sensitive areas (such as stream banks, wetlands, estuaries, ponds, lake shores, and riparian zones). Such measures include:

- Designated skid trails
- Gravelling of roads and stream crossings
- Winter logging
- Skid trail rehabilitation
- Avoiding mechanical equipment on steep slopes or saturated soil

Protection is to be achieved by reducing the physical disturbance to soils and maintaining ground cover to reduce erosion (EPA 2010).

A key concept of BMPs is that if monitoring identifies any circumstance of noncompliance with State water quality standards, then the Forest Service is obligated to respond to the situation to restore compliance. As long as BMPs have been applied and monitoring and adjustments are ongoing, then the Forest Service is in compliance with the CWA (IDEQ 2008a).

The effectiveness of forestry BMPs has been studied extensively (EPA 2010, Belt et al. 1992; Dissmeyer 1994; Seyedbagheri 1996; IAC-IDEQ 2008). Application of BMPs would be a requirement for the project. BMPs, as described in the National BMPs for Water Quality Management on National Forest System Lands, Volume 1: National Core BMP Technical Guide (USDA 2012), and Soil and Water Conservation Practices (USDA Forest Service 1988), would be applied to all ground-disturbing activities to reduce or minimize effects on soil and water resources (Table 2-1). BMPs are incorporated into a project through B and C provisions in the Timber Sale Contract. BMP effectiveness ratings are based on research literature. The expected effectiveness of each BMP for this project is either high (greater than 90 percent) or moderate (75-90 percent). These practices have proven effective elsewhere on the Forest in minimizing off-site impacts (e.g., sediment movement to draws or channels) (USDA Forest Service 1998 and 1999).

Summary of Direct and Indirect Effects

Although all alternatives promote the objective to promote watershed restoration and identify roads for decommissioning, especially in RCAs, Alternative C provides the most benefit to the soil, watershed, riparian, and aquatic resources. This is due to the increased level of watershed restoration that road decommissioning and long-term closure treatments accomplish within the project area. The Watershed Condition Indicator for road density is also improved most effectively under Alternative C. Alternative D constructs the most temporary roads and Alternative C has the least. This has an effect on the maximum sediment over natural estimated by the BOISED model for each subwatershed. The alternatives provide a

range options for implementing current road policy and for managing system roads and unauthorized routes.

Alternative D and E retain the 60 miles of Level 2 closed system roads. This affects the amount of Minimum Road System that would require maintenance in the future. Alternative B and D retain 403 miles of MRS, Alternative C retains 341 miles and Alternative E retains 422 miles.

For all alternatives the ECA analysis shows that drainages within the project area are at risk for increased peak flows. The channel condition risk is increased for 7 drainages under Alternative C and D and 9 drainages under Alternatives B and E. Over time, as harvest treatment areas mature and re-grow, all ECA levels will generally slowly decrease. However, natural disturbance events can also affect ECA levels.

3.3.5 Cumulative Effects

Within the Weiser River subbasin, the entire West Fork of the Weiser River watershed including Lost Creek and the Upper Weiser River to the confluence with the West Fork of the Weiser River is analyzed. In the Little Salmon River subbasin, cumulative effects are evaluated for the entirety of Boulder Creek to the confluence at the Little Salmon River. The cumulative effects area totals 134,136 acres or approximately 210 square miles. Figure WS-1 displays the area analyzed for direct, indirect, and cumulative effects for Watershed resources. Table WS-12 lists indicators for the direct and indirect effects analysis generalized over the cumulative effects area.

Past management activities, including roads, grazing, and timber harvest, residential development, agriculture, recreation, have increased background levels of sediment in streams within the cumulative effects analysis area. A summary of projects that may contribute to cumulative effects within the project area can be found in Appendix E of the Draft Environmental Impact Statement.

The same indicators used for the Direct and Indirect Effects analysis were extrapolated to the cumulative effects area (Table WS-1). Effects were assessed in a qualitative manner, except for Boulder Creek BOISED results which included the cumulative effects area. ECA was not analyzed at this scale as research studies are based on smaller drainages.

Alternative A (No Action) would not contribute to the cumulative amount of sediment reaching the Little Salmon River or the Weiser River. It would not contribute to a change in peak or base flows, or implement any prescribed fire, vegetation or watershed restoration activities.

Under the action alternatives, beneficial uses would not be impaired. Generally, proposed actions would result in a slight increase in sediment in the short term, and a decrease in sediment over the long term. The BOISED model indicates that all action alternatives would result in a decrease in the cumulative amount of sediment within Boulder Creek in the long term. It is unlikely that this change in sediment levels would be measurable at the mouth Boulder Creek or on the Weiser River at the confluence with the West Fork of the Weiser.

Table WS-12. Indicators for Watershed Cumulative Effects

Cumulative Effects Area – Weiser River above WFW and Boulder Creek to LSR							
WCI	**Indicator**		**ALT A**	**ALT B**	**ALT C**	**Alt D**	**Alt E**
Sediment in Cumulative	Maximum increase from existing percent	Boulder Creek	4.5	14.0	8.9	15.0	14.0

Cumulative Effects Area – Weiser River above WFW and Boulder Creek to LSR							
WCI	**Indicator**		**ALT A**	**ALT B**	**ALT C**	**Alt D**	**Alt E**
Effects Area	over natural	Weiser River above WFWR	No Change	Slight Increase	Slight Increase	Slight Increase	Slight Increase
	Percent difference of sediment yield over 15 years from Existing Condition	Boulder Creek	0%	52%	8%	60%	84%
		Weiser River above WFWR	No Change	Increase	Slight Increase	Increase	Increase
	Long-term annual percent over natural sediment yield	Boulder Creek	4.5	3.4	2.6	3.4	3.5
		Weiser River above WFWR	No Change	Slight Decrease	Decrease	Slight Decrease	Slight Decrease
Road Density/Location RCAs Floodplain Connectivity	Total miles of unauthorized route and system road		No Change	Slight Decrease	Slight Decrease	Slight Decrease	Slight Decrease
	Total Road Density and System Road Density by subwatershed		No Change	Slight Decrease	Decrease	Slight Decrease	Slight Decrease
	Miles of road within RCAs		No Change	Slight Decrease	Slight Decrease	Slight Decrease	Slight Decrease

Past Actions

Roads

Associated historic roads and skid trails contribute to a loss in soil productivity and hydrologic function. If not revegetated or recontoured, they can also channel overland flow and cause rills and gullies. Past harvest may have affected the timing and duration of peak flows in the drainage.

The cumulative effects area includes roads that are off-forest that deliver sediment, especially those located within 200 feet of streams or waterbodies, contribute to the cumulative condition for sediment, floodplain connectivity, and in specific locations, streambank condition.

Ongoing and Proposed Actions

Travel Management Plan

The Payette National Forest has revised motorized travel management on the Forest, including within the cumulative effects area for this project. Indiscriminate cross country travel by motorized vehicles, including ATVs, motorcycles, four wheel drives, etc. is prohibited except as authorized by valid permits. All motorized travel is restricted to designated roads and trails, including short distances off of those travelways for the purpose of fuelwood gathering and dispersed camping in designated locations.

Changes in areas designated for cross-country motorized travel and designated OHV trails, especially in areas with highly erodible soils, can benefit water quality by reducing erosion and sediment delivered to streams.

Noxious Weed Management

Mitigation measures have been developed to minimize the risk of adverse effects of noxious weed treatment to water quality. Implementing these measures with weed treatment would be expected to yield no or negligible effects on sediment, temperature, and other WCIs, and would not be expected to contribute to the cumulative condition the watershed.

Recreational Use

Snow machines, road and trail use by OHVs, motorcycles, and mountain bikes, causes erosion and ground disturbance and is expected to increase as the human population increases and development continues. These activities are expected to adversely affect sedimentation and water quality in the cumulative effects area.

Road Maintenance

Routine road maintenance occurs on most open roads within the area. Maintenance on gravel and native surface roads is mainly surface grading, culvert cleaning and replacement of gravel on the road. Road maintenance on Forest roads would not be expected to appreciably affect sediment within the effects area because measures have been developed and agreed upon by NOAA Fisheries and USDI Fish and Wildlife Service to yield negligible road maintenance associated effects on threatened fish species or critical habitat.

Livestock Grazing

Actively grazed range allotments within the cumulative effects area contribute to loss of ground cover in RCAs and conversion of desirable native vegetation to less favorable weedy species. Wetlands are at risk for compaction as well and possible effects to shallow water tables.

Proposed and Ongoing Timber Harvest

The East Fork of Lost Creek NIDGS Habitat Improvement Project, Boulder Thin and Upper Weiser River Condition Class Project are recently completed or ongoing projects with prescribed fire, road maintenance, road construction and reconstruction, and road decommissioning within Lost Creek, Boulder Creek and the Upper Weiser River. These projects are considered as part of the existing condition baseline for the effects analysis. These projects are included in the analysis for cumulative environmental effects as well. Prescribed fire activities from the Upper Weiser Condition Class Project have occurred within the last 5 years. Road decommissioning under the East Fork of Lost Creek NIDGS Habitat Improvement Project is planned for implementation in 2013.

State Highway 95

State Highway 95 runs through the cumulative effects area. Normal road maintenance activities occur on these highways, including de-icing in the winter. De-icing on State Highway 95 through Weiser Canyon may be resulting in increased concentrations of sodium and chloride concentrations in river. Concentrations of de-icing chemicals used in northern Idaho on similarly maintained Idaho highways were found to be an order of magnitude higher than stream runoff not exposed to highway runoff (IDEQ 2011b).

Recreation

A myriad of other recreational activities occur within the cumulative effects area year-long. There is one developed campgrounds located south of Lost Creek Reservoir within the Lost Creek drainage and dispersed camping is widespread, especially on the west shore of Lost Valley Reservoir and throughout the

entire cumulative effects area during the snow free months. The area is popular with hunters and berry pickers in the fall and snowmobilers in the winter. There are proposed groomed snowmobile trail routes that traverse the area.

Wetlands and Floodplains

Within the cumulative effects area wetlands and floodplains are an important part of the hydrologic functionality. Floodplains of varying extent are associated with streams within the cumulative effects area. Past activities have had an effect on wetlands and floodplains. Impacts have been related to historic logging in riparian areas, road construction, placement of drainage structures, cattle grazing, irrigation, flow alteration, and agricultural activities. The floodplains and wetlands associated with the West Fork of the Weiser, Boulder Creek, and Weiser River have been impacted by Lost Valley Reservoir, State Highway 95, and numerous roads within RCAs. Action alternatives propose to decommission 22 to 48 miles of road within RCAs. Removal of these roads will improve floodplain function and benefit riparian dependent species. This could result in an incremental improvement for hydrologic functionality in the cumulative effects area. No adverse cumulative effects on wetlands and floodplains are expected from the proposed project.

Cumulative Effects Summary

Existing harvest units and roads (especially roads in RCAs), road maintenance, livestock grazing, and recreational activities may affect stream conditions and watershed indicators within the effects area and would be expected to continue to affect water quality parameters such as stream temperature, nutrients, bacteria, and sediment. In combination with the other activities in the cumulative effects area, the proposed project is not expected to have any detectable cumulative effect on watershed resources or water quality in the Little Salmon River, Weiser River, or their tributaries. Road decommissioning planned within the cumulative effects area is expected to result in a reduction of sediment produced by roads over time.

3.3.6 Irreversible and Irretrievable Commitments

The action alternatives are not expected to create any impacts that would cause irreversible or irretrievable commitment of aquatic habitat, water quality or watershed conditions. Project design features found in Chapter 2 when combined with the implementation of Best Management Practices for soil and water (USDA 2012) would be used to prevent irreversible and irretrievable losses to watershed resources.

3.3.7 Forest Plan Consistency

Alternative A (no action) meets all Forest Plan standards and guidelines for water and riparian resources as no management activity is proposed to increase sediment or cause land disturbance. WCIs are maintained or improved. Alternative A does not propose any rehabilitation of unneeded roads although they would continue to recover through natural processes.

With implementation of all project design features and BMPs as described in this DEIS, the action alternatives would meet all Forest Plan standard and guidelines for water and riparian resources. WCIs are maintained or improved. Although temporary and short-term increases sediment may occur, long-term reductions in road-related sediment are documented in the effects analysis. Project design features and mitigation measures minimize effects to water and riparian resources. Monitoring would be conducted to ensure that BMPs and project design features are implemented and effective in reducing nonpoint source pollutants.

Project design features and mitigation measures minimize effects to water and riparian resources. Monitoring would be conducted to ensure that BMPs and project design features are effective in reducing nonpoint source pollutants. See the Forest Plan Consistency Checklist in Appendix I of the Watershed Specialist Report for where, why, and how the project shows compliance with Management Direction from the Forest Plan.

3.3.8 Project Record

This DEIS hereby incorporates by reference the Watershed Specialist Report in the Project Record (40 CFR 1502.21). The report is located in the Watershed Section of the project record and contains the data, methodologies, analysis, maps, references, and technical documentation that the hydrologist relied upon to reach the conclusions in this DEIS.

3.4 Soils

3.4.1 Scope of Analysis

Effects on soil resources are analyzed by "activity areas", which are different for each indicator. The Forest Plan describes the activity area as "the smallest logical land area where the effect that is being analyzed or monitored is expected to occur" (Forest Plan page GL-1). The Forest Plan further describes specific activity areas that are to be utilized for analysis. For the Detrimental Disturbance (DD) indicator, the activity areas are each of the individual treatment units. For the Total Soil Resource Commitment (TSRC) indicator, the activity area is the National Forest system lands within the project area (approximately 63,100 acres). This excludes private lands, Lost Valley Reservoir in the southeast part of the project area, and the Rapid River Inventoried Roadless Area (IRA), which encompasses the Pony Creek Research Natural Area (RNA) in the north, as shown in Figure SP-1.

3.4.2 Desired Condition

The desired condition for the soil resource (Forest Plan page III-18) is:

"Soil protective cover, soil organic matter, and coarse woody material are at levels that maintain or restore soil productivity and soil-hydrologic functions where conditions are at risk or degraded."

"Soils also have adequate physical, biological, and chemical properties to support desired vegetation growth."

"Management actions result in no long-term degradation of soil resource conditions."

Forest Plan (page III-21) standards require management activities that may affect soil productivity to meet the following requirements for DD and TSRC:

SWST02 - "In an activity area, where existing conditions of detrimentally disturbed soil are below 15 percent of the area, management activities shall leave the area in a condition of 15 percent or less detrimental disturbance following completion of the activities. In an activity area where existing conditions of DD exceed 15 percent of the area, management activities shall include mitigation and restoration so that DD levels are moved back toward 15 percent or less following completion of the activities."

SWST03 - "In an activity area, where existing conditions of TSRC exceed 5 percent of the area, management activities shall include mitigation and restoration so that TSRC levels are moved back toward 5 percent or less following completion of the activities.

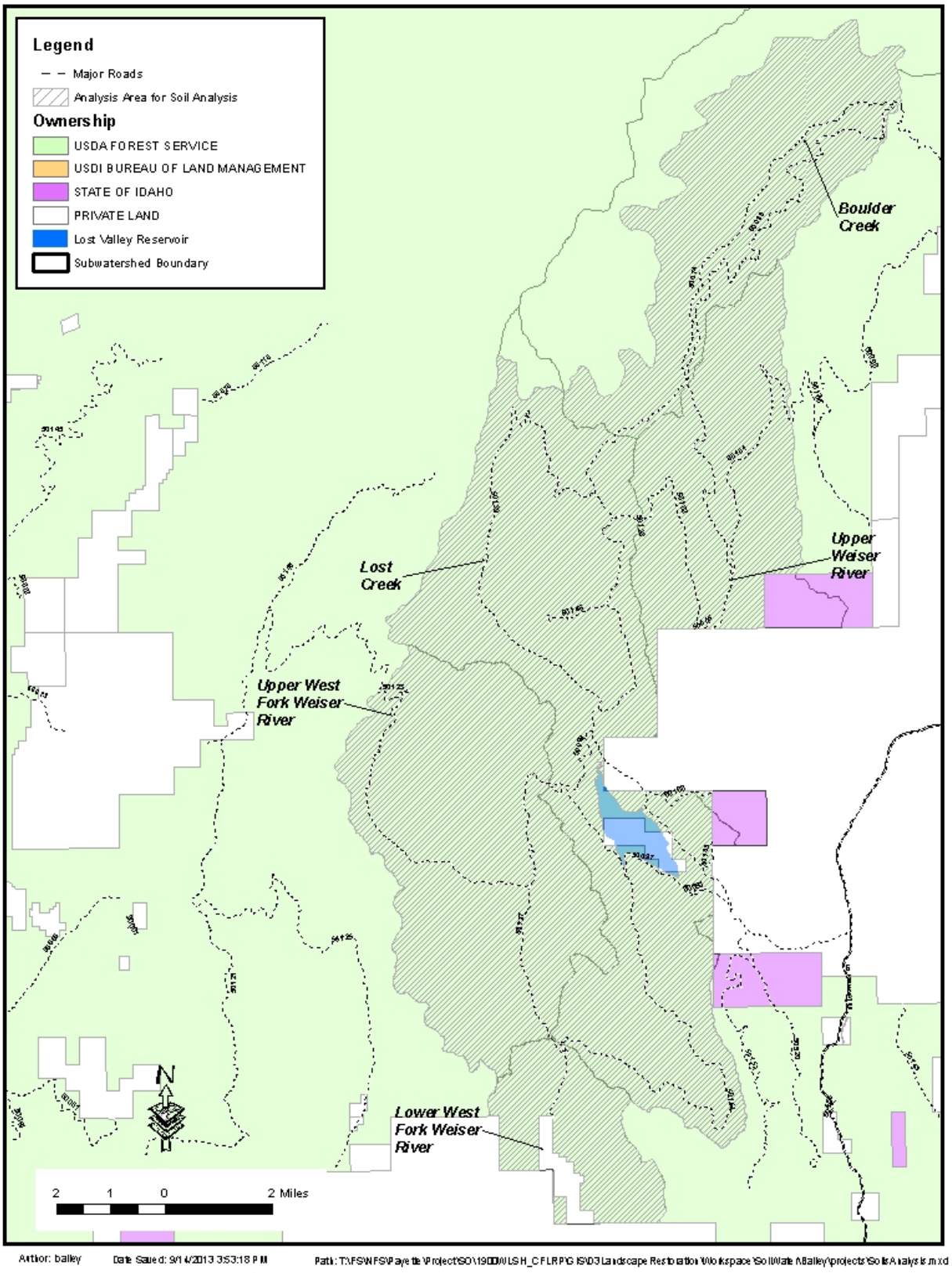


Figure SP-1. Soils Analysis Area.

3.4.3 Existing Condition

The geology, topography, and geomorphic processes, which helped formed the soils in the project area, are described in "Geology of the Payette National Forest" (Lund 2004) and the "Soil-Hydrologic Reconnaissance New Meadows Ranger District, Payette National Forest" (Thompson et al 1973). Landslide-prone (LSP) lands were identified and evaluated using the SINMAP model. There are two major geologic map units in the proposed project area: The Grande Ronde and Imnaha Basalts of the Columbia River Basalt Group, and the Metamorphosed volcanic/plutonic complex (Cretaceous and Jurassic to Permian). A description of each can be found in the Soils Field Report for this project (Lott 2013).

At the landscape scale, ecological units are defined by general topography, geomorphic process, surficial geology, associations of soil families, and potential natural communities, patterns, and local climates. These factors affect biotic distributions, hydrologic function, natural disturbance regimes, and general land use. Local landform patterns become apparent at this level in the hierarchy, and differences among units are usually obvious to on-the-ground observers. At this level, terrestrial features and processes may also have a strong influence on ecological characteristics of aquatic habitats. Landtype association ecological units represent this scale in the hierarchy. These are groupings of landtypes or subdivisions of subsections based on similarities in geomorphic process, geologic rock types, soil complexes, stream types, lakes, wetlands, subseries or plant association vegetation communities. Repeatable patterns of soil complexes and plant communities are useful in delineating map units at this level. Names of Landtype Associations are often derived from geomorphic history and vegetation community (Cleland et al 1997).

Landtypes, subdivisions of landtype associations, are based on similarities in soils, landform, rock type, geomorphic process, and plant associations. Land surface forms that influence hydrologic function (for example, drainage density, dissection, and relief) are often used to delineate different landtypes in mountainous terrain. Valley bottom characteristics (for example, confinement) are commonly used in establishing riparian landtype map units (Cleland et al 1997). This local level of mapping is described in the Soil-Hydrologic Reconnaissance for the New Meadows Ranger District (Thompson et al 1973) and was field verified for the project area in the Soils Field Report, located in the project record (Lott 2013). See Figure SP-2 for a map of landtypes within the analysis area.

Landtype associations included in the analysis area include Depositional Lands, Volcanic Glacial Trough Lands, Cryplanated Volcanic Lands, Croplanated Granitic Lands, Fluvial Lands, Steep Granitic Mountain Slopes, and Structurally Controlled Lands (Plateaus and Escarpments).

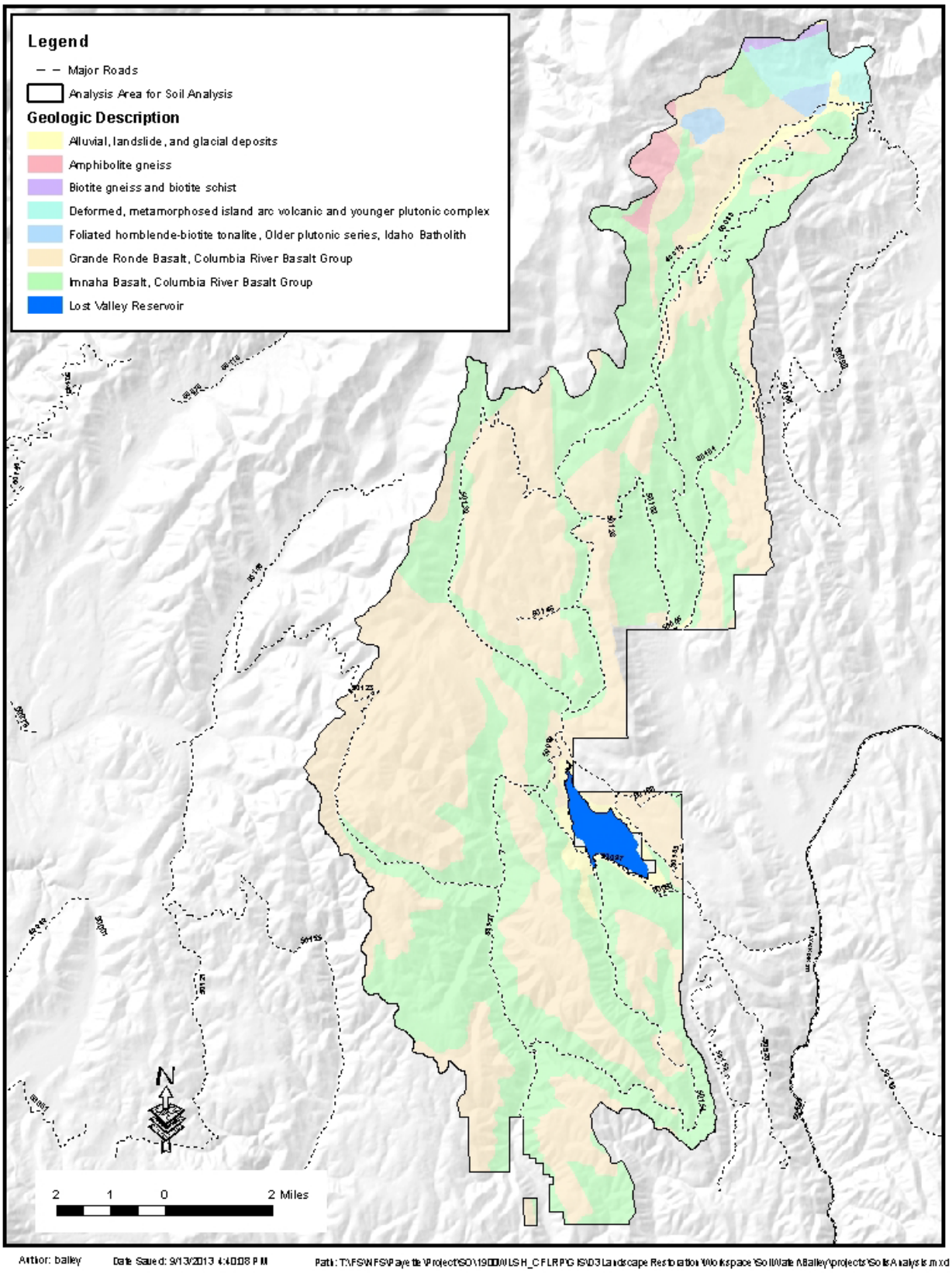


Figure SP-2. Geology within the analysis area.

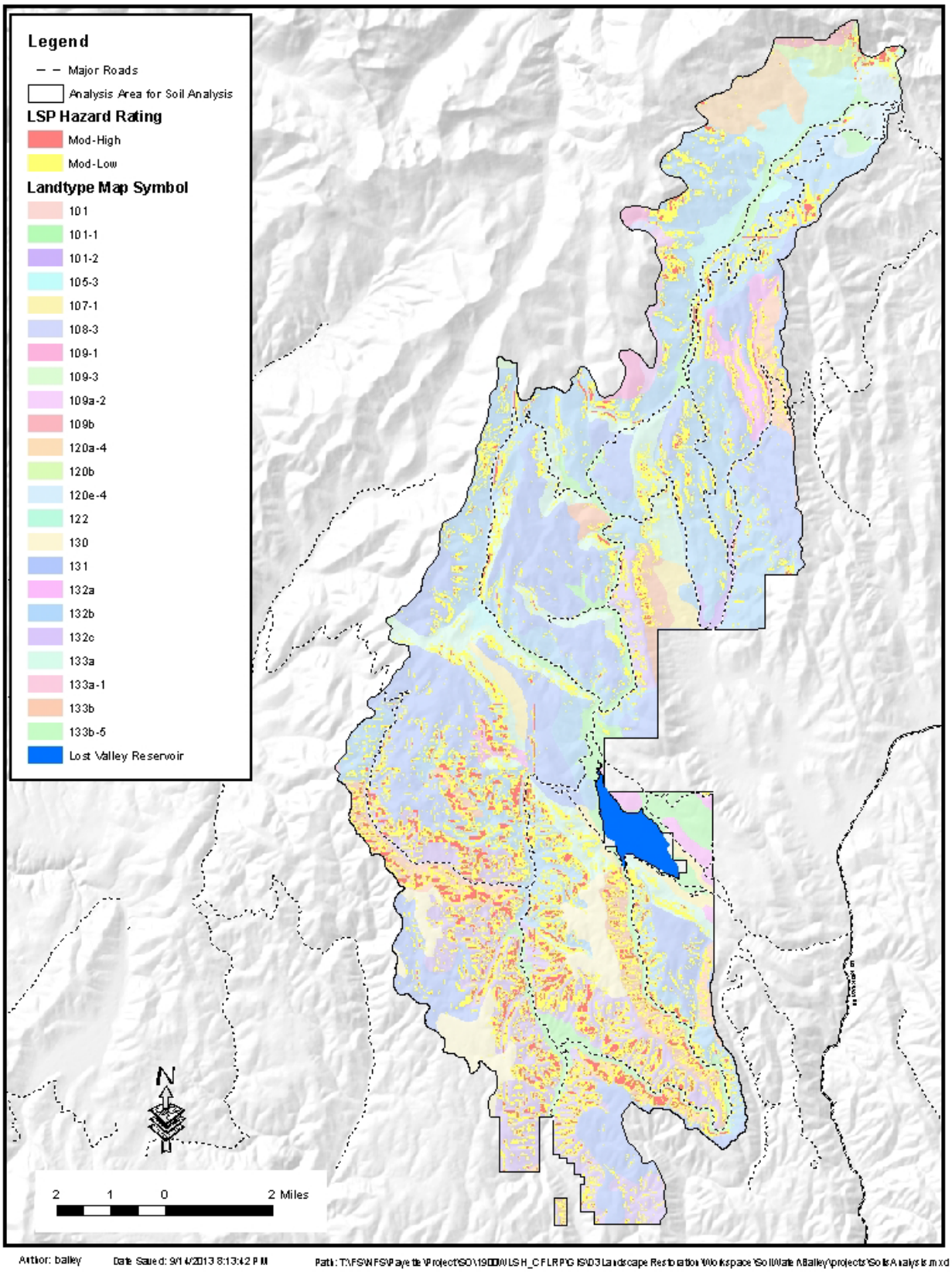


Figure SP-3. Landtypes and LSP areas within the analysis area.

Depositional Lands

This Landtype Association (landtypes 101, 101-1, and 101-2, 105-3, and 107-1 in the project area) is characterized by the nearly level to gently sloping alluvial and toe slope lands that are commonly adjacent to or near water; within the project area these are along or near the West Fork of Weiser River, Lost Creek, and Boulder Creek. Soils are dominantly deep, with standing water and high water tables common, especially during snowmelt. These more gently sloping lands provide an important buffer to soil erosion and sediment production from the steeper surrounding uplands. The primary management concern associated with these landtypes are their close proximity to streams and the compaction and trafficability concerns related to fine textured soils and high water tables.

Volcanic Glacial Trough Lands

This Landtype Association (landtype 108-3 in the project area, which occurs very minimally) formed where ice currents picked up materials and moved them downstream from the Strongly Glaciated (Landtype Association). These lands contain much of the material that was removed from the drainage heads when these landtypes formed; consequently, soils are generally deep. These lands are generally well-drained, with moderate inherent erosion hazards and low to moderately low mass wasting hazards.

Cryoplanated Volcanic Lands

This Landtype Association (landtype 109-1, 109-3, and 109a-2 in the project area) generally occurs in the higher elevations adjacent to glaciated areas. Lands are characterized by generally gentler slopes, weak drainage dissection, and highly fractured bedrock (which allows for high rates of percolation). Inherent erosion hazards are generally low. Higher elevations and short growing seasons reduce timber and vegetation production. In some locations these lands have been overgrazed in the past, and are slow to recover.

Cryoplanated Granitic Lands

This Landtype Association (landtype 109b in the project area) generally occurs in the higher elevations, and formed adjacent to glaciated areas; see the description of Cryoplanated Volcanic Lands above; the only difference is the parent material (in this case intrusive, plutonic vs. extrusive, volcanic rock).

Fluvial Lands

This Landtype Association (landtypes 120-b and 120a-4, and 120e-4 in the project area) is essentially unglaciated and have definite drainage patterns resulting from the erosive force of running water. Although the fluvial action of stream cutting is the dominant geomorphic process, mass wasting, faulting and uplift have also contributed to the current geomorphology. The primary management concern is risk for natural slides and slumps and failure of cut and fill slopes on constructed roads.

Steep Granitic Canyon Slopes

This Landtype Association (landtype 122 in the project area) is the result of previously gentle slopes going through some “rejuvenation”, such as the uplifting of a central mountain core. This uplifting increased stream gradients, causing streams to downcut and sideslopes to steepen as a result. These lands are being

rejuvenated, resulting in intense geologic erosion. These lands are unstable for activities such as road building and have high erosion rates.

Structurally Controlled Lands (Plateaus and Escarpments)

This Landtype Association (landtypes 130, 131, 132a, 132b, 132c, 133a, 133a-1, 133b, and 133b-5 in the project area) is characterized by relatively stable lands that have formed as the direct result of the geologic structure of basalt flows that originally produced relatively flat lands. This post basalt flow landscape has subsequently been tilted, uplifted, and eroded over time producing landforms (landtypes) that consist of moderately to steeply sloping dip slopes, scarp slopes, and escarpments. The primary management concerns associated with these landtypes are risks for natural slides and slumps and failure of cut and fill slopes on constructed roads.

Table SP-1. Landtype Information and Soil Interpretations within the Soils Analysis Area.

Landtype Association	Landtype	Acres	% of Area	Slope (%)	Soil Depth (in)	Inherent Erosion Hazard	Mass Stability Hazard
Depositional Lands	101	0.4	<1%	0-5%	40-60	Mod Low	Low
	101-1	3582.6	6%	0-10%	22-60	Low-Mod Low	Low
	101-2	983.6	<1%	0-15%	21-44	Moderate	Low
	105-3	1619.6	2.6%	5-15%	50-60	Mod Low-Mod	Low
	107-1	998.5	1.6%	15-30%	22-47	Mod Low- Mod	Low- Mod
Volcanic Glacial Trough Lands	108-3	48.5	< 1%	30-50%	<20-60	Moderate	Low-Mod Low
Cryoplanated Volcanic Lands	109-1	332	<1%	5-30%	21-44	Mod Low-Mod	Low
	109-3	33.4	<1%	35-60%	21-44	Mod-Mod High	Low- Mod Low
	109a-2	294.4	<1%	35-60%	22-36	Moderate	Mod-Mod High
Cryoplanated Granitic Lands	109b	175.3	<1%	30-50%	40-60	Moderate	Low-Mod Low
Fluvial Lands	120a-4	1071.9	1.7%	15-35%	22-47	Moderate	Low-Mod Low
	120b	575.8	<1%	30-70%	30-50	Mod-Mod High	Low-Mod Low
	120e-4	659.7	1%	20-40%	48-60	Moderate	Low-Mod Low
Steep Granitic Canyon Slopes	122	23.1	<1%	65-80%	<20	Mod High-High	Low (slides)-Mod-Mod High (slumps)
Structurally Controlled Lands (Plateaus and Escarpments)	130	1913.5	3%	5-20%	22-47	Mod Low-Mod	Low
	131	13850.9	22.0%	10-35%	22-47	Mod Low-Mod	Low
	132a	1613.4	2.6%	40-60%	22-47	Moderate	Low
	132b	18408.5	29.2%	45-65%	22-47	Mod-Mod High	Low-Mod Low
	132c	8670.7	13.7%	30-65%	22-26	Mod-Mod High	Mod Low-Mod
	133a	4467.5	7.1%	30-55%	22-47	Moderate	Low-Mod Low
	133a-1	6.2	<1%	50-70%	<20-40	Mod High-High	Moderate

Landtype Association	Landtype	Acres	% of Area	Slope (%)	Soil Depth (in)	Inherent Erosion Hazard	Mass Stability Hazard
	133b	4479.9	7.1%	30-60%	33-49	Mod-Mod High	Low
	133b-5	26.5	<1%	40-65%	<20-40	Mod-High	Moderate

Detrimental Disturbance

"Detrimental soil disturbance is the alteration of natural soil characteristics that results in immediate or prolonged loss of soil productivity and soil-hydrologic conditions" (Forest Plan page GL-10). DD are those effects on the soil resource that cause soils to be compacted, displaced, severely burned, or puddled to an extent that the disturbance meets the criteria (Forest Plan page GL-10) to be detrimental to long-term soil productivity. Detrimentally disturbed soils are often scattered throughout areas of past management and are not always readily visible. Detrimental disturbances can last for decades but, normally, DD successfully recovers from a detrimental condition through natural processes (i.e., freeze/thaw processes, wet/dry cycles, root penetration, rodent burrowing, etc.) over a period of 50 years or less.

The Forest Plan requires DD to be below and remain below 15 percent within activity areas unless current conditions for DD are already above 15 percent. In cases where the current condition is above 15 percent, management activities are required to move DD toward or below 15 percent within those activity areas.

Existing DD in the Lost Creek-Boulder Creek Project area has generally been produced, dominantly, as a result of the random movement of heavy equipment associated with past logging activities. Those areas where DD soils were produced more than 50 years ago have recovered, for the most part, through natural processes over time while the more recent DD soils have only partially recovered. Currently, no on-the-ground DD surveys have been conducted in the project area; therefore, until ground truthing can be done, it is assumed that all past tractor harvest units (approximately 25,830 acres) within the project area have levels of DD that exceed 15 percent. Until data on a more specific level of DD can be gathered, all tractor units proposed for this project will require an improvement in DD after harvest, ensuring that the Forest Plan Standard for DD is met. See the project design feature/mitigation measures in Chapter 2 of the DEIS for more information on how this will be accomplished.

If during ground surveys (using a pace-transect method) or surveys of aerial photography (where this yields a view that shows existing skid trails and landings) DD is found to be under 15 percent, the rehabilitation requirements for that unit will be adjusted to ensure that the Forest Plan Standard for DD is met but will not require an improvement over the existing condition.

Total Soil Resource Commitment (TSRC)

"TSRC is the conversion of a productive site to an essentially non-productive site for a period of more than 50 years." (PNF 2003). TSRC is an effect on the soil that produces conditions that are more visible, longer lasting, and generally results in greater reductions in soil productivity than DD. Examples of TSRC within the Lost Creek-Boulder Creek Project area include roads, landings, primary skid trails and gravel pits. These effects do not completely recover through natural processes but soil productivity can be recovered with the implementation of physical treatments.

Presently, the amount of TSRC in the Lost Creek-Boulder Creek Project area (activity area) is estimated to be 4259 acres or 6.8 percent of the project area. The Forest Plan requires that management actions reduce TSRC to lower levels when existing conditions are greater than 5 percent of the activity area.

Landslide Prone Areas

Mass movements, or landslides, occur when earthen materials become unstable and slide downslope. These mass failures typically occur on steep, concave slopes, oversteepened upper stream banks, and headland areas where surface and subsurface water tends to concentrate, saturating these areas of deeper soil accumulation. Landslide events are most likely to occur after intense storms or during periods of rapid snowmelt and often cause debris slides/torrents and severe gully erosion. Debris slides and torrents contribute sediment to stream channels and can change channel geomorphology, but also provide benefits to aquatic habitats through introduction of large woody debris and coarse substrate. Trees, rocks, and soil material are either deposited directly into streams or the finer particles may eventually reach main channels when tributary drainages flow water. Project Design features to reduce the landslide risk are included as part of the action alternatives; see Chapter 2 of this DEIS.

The project area was also analyzed for mass stability hazards using the landslide predictive model SINMAP (Pack et al. 1998) with calibration parameters developed from the 1997 landslide inventory (Dixon and Wasniewski 1998). The analysis identifies potentially hazardous areas for debris slides. The model does not address the potential for large structural failures. Approximately 2355 acres (3.7 percent) of the project area has been identified with moderate-to-high potential for shallow debris slides (potential landslide prone areas). Within the analysis area there is a concentration of moderate to high potential for slope failure in the north end of the project area in the headwaters of Boulder Creek, and in the southern half of the project area in the upper portion of the West Fork Weiser River subwatershed. These areas have not been ground-truthed but where landslide-prone areas are modeled as falling within the boundaries of proposed harvest units, they will be visited by a specialist trained in field identification of slope stability to determine if site-specific measures need to be taken to maintain the stability of the slope. See Figure SP-2 for a map of landslide prone areas identified by SINMAP.

Figure SP-4 shows a landslide that occurred along the West Fork Weiser River within the project area boundary during the spring of 2011. A plugged culvert on a road parallel to, and several hundred feet uphill of, the West Fork of the Weiser River, rerouted water down the road prism to an area of more sparsely vegetated soils, where it flowed off the road and saturated the steep slope, causing a deep-seated failure in an area modeled correctly by SINMAP as moderate to high risk for landslides. This landslide deposited rock, woody debris, and sediment into the West Fork. As of 2012, vegetation was returning to the disturbed area.

Rooting strength of vegetation is a major factor for adding stability to landslide prone areas. Trees provide the greatest amount of rooting strength. Generally the larger trees have a more developed root system that provides greater rooting strength. Ponderosa pine has a deep tap root that provides greater deep rooting strength than similar sized Douglas-fir. Vegetation management goals in forested areas of high to moderate potential hazards for landslides should emphasize long term, sustainable rooting strength. Thinning trees on these areas should emphasize leaving larger trees more able to resist effects of drought, insects, disease, and wildfire. Skid trail, landing, and temporary road location should be coordinated with a hydrologist or a soil scientist to ensure they are properly located relative to any areas of slope instability.

Figure SP-4. Photo of 2011 landslide along West Fork of the Weiser River in the project area.

3.4.4 Direct and Indirect Environmental Effects

Effects to DD

Alternative A (No Action)

No additional DD would occur and any existing DD associated with past management activities would continue to recover overtime through natural processes (root penetration, gopher/rodent activity, freeze/thaw, wetting/drying, etc.). The Forest Plan standard for detrimental disturbance would be attained since DD would slowly recover toward the goal of 15 percent.

Alternatives B, C, D and E

Site specific project design requirements, mitigation measures, and Best Management Practices (BMPs) have been developed to reduce the potential for additional DD to be produced. Application of these measures, which stipulate the types of heavy equipment that can be used, the soil moisture requirements for the use of heavy equipment, the slopes that heavy equipment can operate on, and the requirement that most equipment remain on skid trails, are expected to ensure that DD levels are not increased.

Management activities within tractor units would include the harvest of trees with equipment operating from designated skid trails or through the use of feller bunchers. Conventional skidders would be required

to remain on designated skidtrails and to cable logs to skid trails while the use of feller bunchers off of the designated skid trails would be restricted to periods of time when soil moistures are less than 20 percent and on slopes less than 35 percent. Preference would be given to whole tree yarding to reduce the amount of material that would need to be piled. See the project design features and mitigation measures for soils in Chapter 2 of this DEIS document.

On slopes less than 45 percent, ground based mechanical logging equipment (e.g. – feller bunchers, skidders, loaders, processors) are required to be kept on roads, landings and designated skidtrails. Equipment operation off of designated roads, trails and landings will be considered in the following situations; 1) when soil moisture is below 20 percent (this can be determined when soil is dry to the touch and does not form a ball when pressure is applied by hand) OR; 2) when the ground is snow covered and/or frozen sufficiently so that soil will not be unacceptably rutted, displaced or compacted.

Use of mechanized equipment (feller buncher or excavator for machine piling) off of designated skid trails on slopes between 35 and 45 percent slope should only be considered when existing DD is less than or equal to 10 percent and requires approval of a Forest Service Soil Scientist.

If surveys indicate that some units have DD levels at or in excess of 15 percent, it is required that a net reduction in DD be accomplished with the implementation of the project (Forest Plan Standard SWST02). The units may require an alternative method of site preparation (i.e. broadcast burning). Units that may exceed 15 percent after logging or brush disposal will need to be evaluated prior to brush disposal to determine if piling or broadcast burning will be implemented.

Piling of slash on areas that are not presently considered DD or TSRC may cause the areas beneath the slash piles to become DD as a result of severe burning. All slash piling would favor the placement of piles onto existing roads, landings, and skid trails to minimize the creation of additional DD.

For all alternatives the existing DD would continue to recover through natural processes. DD levels would meet the Forest Plan due to existing DD within units that have current DD conditions of 15 percent or more decreasing from de-compaction, recontouring, and rehabilitation of new and existing skid trails in these units. Fully recontouring constructed skid trails would result in the relocation of upper horizon material where soil displacement has previously occurred.

The use of prescribed fire would not affect DD levels since burning would be restricted to periods of time when soil moistures are high, and the burn plan prescription would be for low to moderate intensity fire.

Effects to TSRC

Alternative A (No Action)

No management activities would occur. None of the existing TSRC or DD would be returned to productivity and no additional TSRC or DD would be produced. TSRC would remain in excess of the Forest Plan goal at 6.3 percent of the activity area.

Alternative B

This alternative would result in a reduction to 5.9 percent TSRC for the project area due to the decommissioning of roads. This would be accomplished through the combination of decommissioning all

TSRC that is produced by management activities (landings and skid trails) and obliterating 159 miles of existing system and unauthorized road. Additional reductions in TSRC would be realized if existing unauthorized roads are used as temporary roads and then obliterated, or if constructed (primary) skid trails and landings are utilized and then obliterated. The Forest Plan standard for TSRC would be met as TSRC is reduced toward 5 percent of the project area.

Alternative C

This alternative would result in a reduction to 5.3 percent TSRC for the project area due to the decommissioning of roads. This would be accomplished through the combination of decommissioning all TSRC that is produced by management activities (landings and skid trails) and obliterating 249 miles of existing system and unauthorized road. Additional reductions in TSRC would be realized if existing unauthorized roads are used as temporary roads and then obliterated, or if constructed (primary) skid trails and landings are utilized and then obliterated. The Forest Plan standard for TSRC would be met as TSRC is reduced toward 5 percent of the project area; this alternative would result in the greatest reduction in TSRC.

Alternative D

This alternative would result in a reduction to 6.0 percent TSRC for the project area due to the decommissioning of roads. This would be accomplished through the combination of decommissioning all TSRC that is produced by management activities (landings and skid trails) and obliterating 159 miles of existing system and unauthorized road. Additional reductions in TSRC would be realized if existing unauthorized roads are used as temporary roads and then obliterated, or if constructed (primary) skid trails and landings are utilized and then obliterated. The Forest Plan standard for TSRC would be met as TSRC is reduced toward 5 percent of the project area.

Alternative E

This alternative would result in a reduction to 6.0 percent TSRC for the project area due to the decommissioning of roads. This would be accomplished through the combination of decommissioning all TSRC that is produced by management activities (landings and skid trails) and obliterating 142miles of existing system and unauthorized road. Additional reductions in TSRC would be realized if existing unauthorized roads are used as temporary roads and then obliterated, or if constructed (primary) skid trails and landings are utilized and then obliterated. The Forest Plan standard for TSRC would be met as TSRC is reduced toward 5 percent of the project area.

3.4.5 Cumulative Effects

Cumulative effects for the soil resource include all past, present, and foreseeable future actions that would cause DD and TSRC effects within the activity areas for the Lost Creek-Boulder Creek Project. The activity areas for the analysis of cumulative effects for DD and TSRC are identical to the activity areas described for direct and indirect effects since these indicators do not affect and are not affected by soil productivity on other sites.

The effects of past management actions on DD and TSRC are included in the Existing Condition. No reasonably foreseeable effects of future actions on TSRC and DD in the activity areas are known at this time.

The Travel Management Plan was recently implemented to restrict general OHV (off highway vehicles) use to designated travelways (roads and trails). Additionally, the Travel Management Plan allows for OHV use for parking in 600 foot corridors adjacent to designated roads (300 feet either side) and 200 foot corridors adjacent to designated trails (100 feet either side).

The cumulative effect of the Travel Management Plan on soil productivity in the Lost Creek-Boulder Creek Project area would be variable within activity areas. Additional effects would only be produced in activity areas or portions of activity areas that are also within the defined corridors of use (along roads and trails). DD may decrease as a result of limiting OHV use to only designated routes and corridors while not allowing OHV use on the vast majority of the Forest land outside of corridors, which is presently allowed. On the areas outside of the corridors, where OHV use is no longer allowed, DD would naturally recover over time. TSRC within the Lost Creek-Boulder Creek Project area, however, may increase as OHV effects on soils are concentrated to areas within corridors where OHV's travel to park. These concentrations of use would become TSRC as soils are compacted or displaced, resulting in long-term commitments of the area. Additionally, all existing TSRC effects, both inside and outside of the designated corridors, would remain since TSRC does not completely recover naturally. Specific cumulative effects from the Travel Management Plan Revision are difficult to predict since they are produced by the random use of OHV's within designated corridors. Mitigation measures may need to be developed to assure that Forest Plan standards for long-term soil productivity are attained for future project.

Table SP-2. Indicators– Comparison by Alternative

Indicator	ALT A	Alt B	Alt C	Alt D	Alt E
Is the Forest Plan Standard for DD met? (moving toward or below 15 percent for an activity area)	**Yes** No change from existing conditions from this project.	**Yes** No increase to DD due to design features and mitigation measures.	**Yes** No increase to DD due to design features and mitigation measures.	**Yes** No increase to DD due to design features and mitigation measures.	**Yes** No increase to DD due to design features and mitigation measures.
Is the Forest Plan Standard for TSRC met? (moving toward or below 5 percent for an activity area)	Yes 6.8%	Yes 5.9%	Yes 5.3 %	Yes 6.0%	Yes 6.0%

3.4.6 Irreversible and Irretrievable Commitments

Under Alternative A, the acres of irretrievable TSRC would continue until the disturbances are returned to a productive capacity by restoring soil productivity and hydrologic function. Under the action alternatives, a net reduction of irretrievably committed land would result by returning the acres returned to productivity through skid trail, landing, and road obliteration. No irreversible commitments to soil productivity would be created as a result of any alternatives associated with this project.

3.4.7 Forest Plan Consistency

Alternative A (No Action Alternative) does not increase levels of TSRC. No management activity occurs to move TSRC from a current condition of 6.8 percent toward 5 percent or less. Alternative A does not meet Forest Plan standards for long-term soil productivity because no net reduction in TSRC would occur to move toward five percent. Alternative A does meet the Forest Plan standard for DD due to levels of DD continuing to recover through natural processes.

Alternatives B, C, D, and E meet the Forest Plan standard for TSRC as acreage is removed from TSRC and returned to production through the obliteration of roads. Alternative C moves TSRC to the lowest percent and closest to the Forest Plan standard. All action alternatives also meet the Forest Plan standard for DD by maintaining DD at levels below 15 and by decreasing DD levels when current conditions are above 15 percent. All action alternatives include project design features to avoid inducing instability on potentially landslide prone areas.

3.4.8 Project Record

This EIS hereby incorporates by reference the Soil specialist report in the project record (40 CFR 1502.21). The report is located in the Soils Section of the project record and contains the data, methodologies, analysis, maps, references, and technical documentation that the specialist relied upon to reach the conclusions in this EIS.

3.5 Fisheries Resources

3.5.1 Scope of the Analysis

The analysis area for fish and fish habitat is larger than the proposed project area (Figure FH-1). The analysis area chosen to assess baseline conditions as well as direct, indirect, and cumulative effects consists of the following complete 6th level Hydrologic Units (HUs) that comprise the project area: Boulder Creek (170602100501), Upper Weiser River (170501240201), Lost Creek (17050124010), Upper West Fork Weiser River (170501240102) and Lower West Fork Weiser River (170501240103). The 6th level subwatershed was determined to be the appropriate scale to assess current conditions as well as project effects as and associated cumulative effects based on the scope and scale of the project. The current USGS watershed boundary GIS layer was used to delineate subwatersheds (GIS 2010).

3.5.2 Desired Conditions

Desired conditions for Soil, Water, Riparian, and Aquatic Resources (SWRA) are described in the Forest Plan (USDA 2003a). The Forest Plan states that 1) riparian and aquatic ecosystems have appropriate types and amounts of vegetation, 2) appropriate large woody debris is sufficient in land and stream channel forms to maintain water quality, filter sediment, aid floodplain development, improve floodwater retention and groundwater discharge, and contribute to diverse habitat components, 3) instream flows are sufficient to support healthy riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to route flood discharges and provide for downstream uses, and 4) the amount, distribution, and characteristics of life-stage habitats are present to maintain or reach viable populations of native and desired non-native species (USDA 2003a, p. III-18)

The desired conditions for Threatened and Endangered Species as described in the Forest Plan are 1) habitats for Threatened and Endangered species are managed consistent with established and approved Recovery Plans, 2) management actions either contribute to or do not prevent recovery or de-listing of these species, 3) habitats for proposed or candidate species are managed to help preclude listings as Threatened or Endangered under the Endangered Species Act, and 4) degrading effects from Forest programs are at levels that do not threaten the persistence of Threatened, Endangered, Proposed, or Candidate species populations (USDA 2003a, p. III-8).

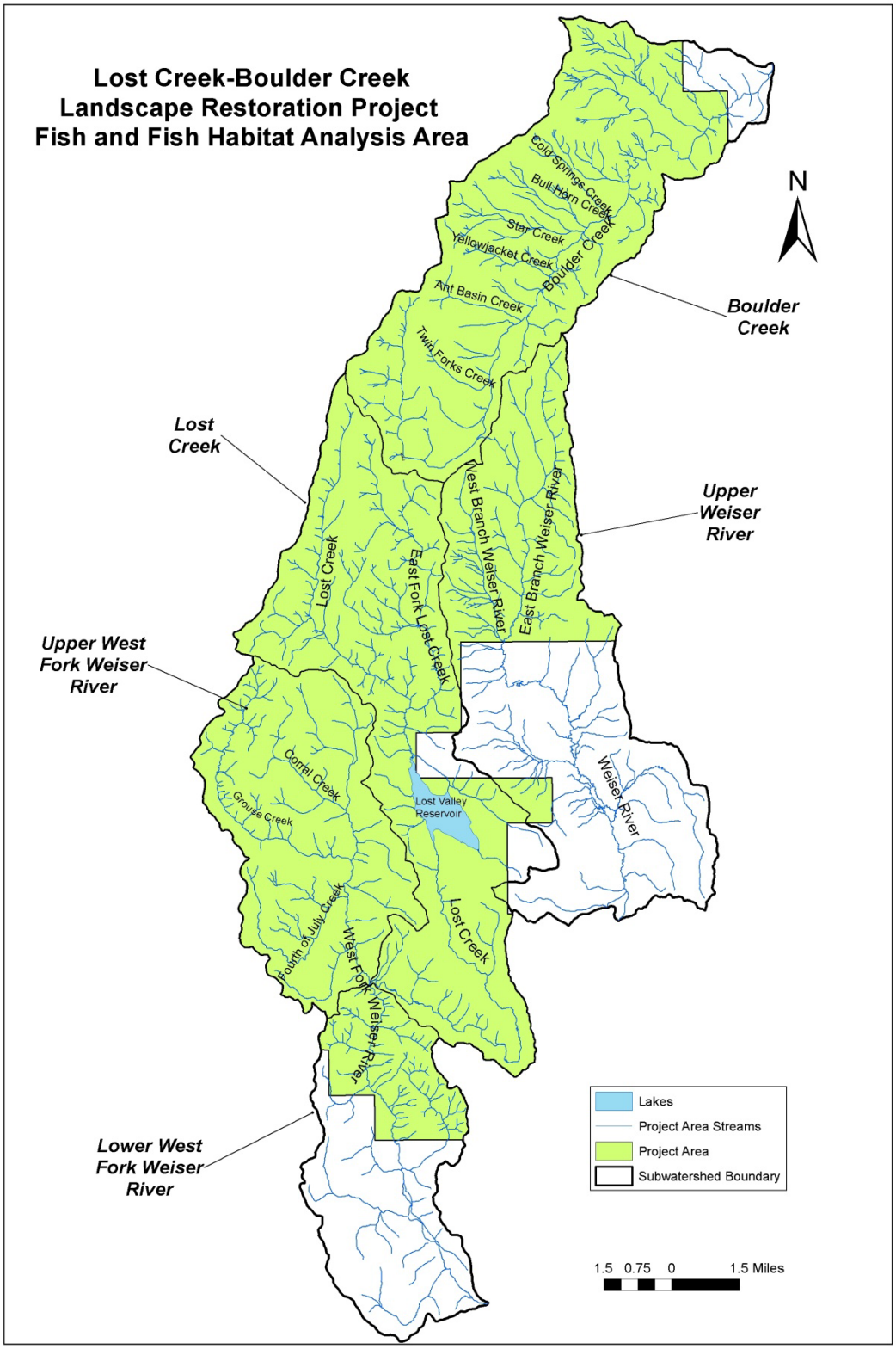


Figure FH-1. Lost Creek-Boulder Creek Landscape Restoration Project Fish and Fish Habitat Analysis Area, including streams and 6th level subwatershed boundaries.

Management Direction

Goals, Objectives, Standards and Guidelines

The Payette National Forest (Payette NF) Land and Resource Management Plan (Forest Plan) provides Forest-wide, long-term management direction in the form of goals, objectives, standards, and guidelines designed to guide land and endangered species management activities on Payette NF administered lands.

Forest Plan Management Areas

Management areas (MAs) were established within the Payette NF to provide effective and efficient management by grouping land areas with similar management goals and prescriptions. The Lost Creek Boulder Creek Project area contains portions of MA 3-Weiser River, MA 4-Rapid River (which encompasses the lower portion of the Boulder Creek subwatershed) and MA 5- Middle Little Salmon River (which encompasses the upper portion of the Boulder Creek subwatershed, which are fully described in the Forest Plan (USFS 2003a pages III-120 through III-163). Each MA has specific direction (additional goals, objectives, standards, and guidelines), designed to tier to Forest-wide direction and to meet Forest-wide goals and desired conditions.

Aquatic Conservation Strategy

The Aquatic Conservation Strategy (ACS) provides direction to maintain and restore characteristics of healthy functioning watershed, riparian areas, and associated fish habitats (USDA 2003a, Appendix B, p B-49 through B-63). It is a refinement and furtherance of approaches outlined in the Inner Columbian Basin Ecosystem Management Project (ICBEMP) Implementation Strategy and USFWS and NMFS (NOAA Fisheries) 1998 Biological Opinions. The ACS is a long-term strategy to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within lands administered by this National Forest. The ACS consists of 8 components that are described in the Forest Plan (USDA 2003a, pages B-48 through B-57). How these components are applied at the subwatershed and site-specific levels will affect the types and outcomes of management actions, and therefore will be an overriding factor that influences potential effects for SWRA resources. The Payette NF Forest Plan developed the Watershed and Aquatic Recovery Strategy (WARS) which makes up components 5, 6, and 7 of the ACS. These components involve multi-scale assessments of current conditions and identify subwatershed restoration type (WARS Class) and prioritization. These are designed to guide aquatic restoration planning across the Forest (USDA 2003a). The WARS class and priority is displayed in Table FH-1 for each of the 5 subwatersheds within the Lost Creek-Boulder Creek Project Area. The information in Table FH-1 was obtained from tables in the WARS database located in the project records. Watershed names and boundaries have been updated since initial development in 2003, but information regarding the restoration priority was estimated from the WARS database based on the old boundaries. Within the project area, the Boulder Creek subwatershed has been identified as a priority for restoration under the ACS (Table FH-1).

Watershed Condition Framework

The Watershed Condition Framework (WCF) (Potyondy and Geier, 2010) establishes a consistent, comparable, and credible process for improving watershed conditions on National Forests and Grasslands. It provides a suite of 12 indicators that are used to classify watersheds into 3 categories: Class 1 – Functioning Properly, Class 2—Functioning at Risk, and Class 3—Impaired. Of the 12 indicators used for watershed classification, the Aquatic Habitat, Aquatic Biota, and Riparian/Wetland Vegetation (indicators 3, 4, and 5 respectively) are the most directly linked to fish and fish habitat. The aquatic habitat indicator

evaluates habitat conditions considering habitat fragmentation, large woody debris and channel shape and function. The aquatic biota indicator assesses the distribution, density, and structure of native and introduced aquatic species. The riparian/wetland vegetation indicators address the condition and function of riparian vegetation (Potyondy and Geier 2010). A crosswalk that compares the Forest Plan Pathways/WCIs to the WCF indicators is available in Bailey (2013) in the project record.

Analyses using this suite of indicators were used to classify all NFS lands nationwide. In turn, a list of "Regional Focus Subwatersheds" was developed, which are priorities for restoration actions. Within the project area, the Boulder Creek subwatershed is identified as a focus subwatershed and classified as Class 3—Impaired.

Table FH-1. ACS and WARS designations for subwatersheds in the Lost Creek-Boulder Creek project area.

6th Level HU	HU Code	ACS Priority	WARS Class	WARS Priority
Boulder Creek	170602100501	Yes	Active	High
Upper Weiser River	170501240201	No	Active	Moderate
Lost Creek	170501240101	No	Active	Moderate
Upper West Fork Weiser River	170501240102	No	Active	Moderate
Lower West Fork Weiser River	170501240103	No	Active	Moderate

Riparian Conservation Areas

Riparian Conservation Areas (RCAs) are stream and wetland protection zones designated to protect riparian-dependent resources. Management activities within these areas are subject to specific Forest Plan goals, objectives, standards, and guidelines. RCAs include traditional riparian corridors, perennial and intermittent streams, wetlands, lakes, springs, reservoirs, and other areas where riparian functions and ecological processes are crucial to maintenance of the area's water quality, sediment regime, large woody debris (LWD), nutrient delivery system, and associated biotic communities and habitat.

RCA buffers have been shown to be effective in protecting streams from non-channelized sediment flow (Belt et al. 1992) and will be implemented for mechanical treatments in this project. Belt et al. (1992) concluded that non-channelized sediment flow does not usually travel more than 300 feet and that 200-300 foot buffers are effective in protecting streams. However, RCA buffers may not entirely protect stream courses from harvest and road related sediment input that is carried through channelized flow. RCA buffers applied to stream channels to protect channels from sediment may also protect recruitable LWD and stream shading (USDA 2003a), providing for maintenance of stream temperatures, LWD and RCA function in the project area.

RCA Delineation

The Forest Plan (Appendix B) outlines criteria to aid delineation of RCAs for perennial and intermittent streams, ponds, lakes, reservoirs, and wetlands (USDA 2003a). The RCAs within the project area have been identified utilizing the Option 2 (USDA 2003a page B-34) delineation method based on site potential tree height.

Option 2 provides a more specific delineation of an RCA boundary using site potential tree heights (when compared to Option 1). Field reconnaissance and stand exam data has indicated that PVG 2, 5, and 6 are the dominant PVGs in forested areas within the proposed activity units in the project area. RCA widths in

forested areas will be based on the more conservative PVG 2 and 6 potential tree heights (USDA 2003a, page B-36), which are displayed in Table FH-2 below.

Table FH-2. RCA distances using Option 2 described in the Forest Plan (page B-34).

Water Body	RCA slope distance*
Perennial Stream	240 feet (two site-potential tree heights from the ordinary high water mark)
Intermittent stream providing seasonal rearing and spawning habitat.	240 feet (two site-potential tree heights from the ordinary high water mark)
Intermittent stream	120 feet (one site-potential tree height from the ordinary high water mark)
Ponds, lakes, reservoirs and wetlands	120 feet (one site-potential tree height from the ordinary high water mark)
Non Forested Stream (perennial and intermittent)	The extent of the flood prone width, or riparian vegetation, whichever is greater.

*Distance from ordinary high water mark (either side of stream).

Best Management Practices

Application of Best Management Practices (BMPs) would be required for this project. BMPs (USDA Forest Service 1988) designed to reduce effects to soil and water would be applied to all ground disturbing activities. BMPs applied to this project are incorporated into mitigation measures and project design features (PDFs) located in Chapter 2 of the Lost Creek-Boulder Creek Landscape Restoration Project FEIS. PDFs are also located in Appendix 3 of this document.

3.5.3 Affected Environment and Current Conditions

Threatened Fish Species

Snake River spring/summer and fall Chinook salmon.

Snake River spring/summer Chinook salmon (*Onchorynchus tshawytscha*) were listed as threatened under the Endangered Species Act (ESA) in 1992 (57 FR 14653). In 1993, the National Marine Fisheries Service (NMFS) established Designated Critical Habitat (DCH) for Chinook salmon (58 FR 68543). This DCH includes “areas consisting of the water, waterway bottom, and adjacent riparian zone of specified lakes and river reaches in hydrologic units presently or historically accessible” to Chinook salmon, with the “riparian zone” defined as 300 feet from the normal line of high water of a stream channel (50 CFR 226.205). Essential Fish Habitat (EFH) as established pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSA, 50 CFR 600) in this area is synonymous with the DCH (PFMC 1999).

Chinook salmon are found only in the Boulder Creek subwatershed within the project area (Figure FH-2). A partial fish passage barrier (natural falls) on Boulder Creek is present at approximately river mile (RM) 4.4 upstream of its confluence with the Little Salmon River (LSR). In the mid-1980s Idaho Department of Fish and Game (IDFG) considered the falls a partial barrier, allowing steelhead to apparently pass, but not allowing Chinook passage every year (Petrosky and Holubetz 1984). In 1985, a project was conducted by

IDFG to modify the falls to improve upstream passage of Chinook salmon over the falls into the upper portions of Boulder Creek. The objectives of the project were to allow Chinook salmon access into the upper 12 miles of Boulder Creek and to increase natural production of Chinook, consistent with IDFG s 1984 Anadromous Fish Management Plan (Petrosky and Holubetz 1984). The project used explosives to modify the falls to allow a "stairstepping" of the 9 foot falls into two, 4-5 foot drops with a jumping pool beneath each (Petrosky and Holubetz 1984). Chinook salmon and eyed eggs were subsequently stocked upstream of the barrier in 1986 and 1988 (Petrosky 1988, USDA 2003b). Juvenile Chinook salmon were observed as far upstream as the vicinity of Twin Forks Creek (Wagoner and Burns 1995), however, ninety-nine percent of juvenile Chinook observed during snorkel surveys conducted in 1991 were found below the falls (USDA 2003b). Currently, Chinook salmon are able to access Boulder Creek upstream of the falls, but the falls may still present a significant upstream migration barrier (USDA 2003b).

Snake River Steelhead

Snake River steelhead (*O. mykiss*) were listed as threatened under the ESA in 1997 (62 FR 43937). Critical Habitat was first designated in 2000 (65 FR 7764), later withdrawn, and designated again in 2005 (70 FR 52629). Steelhead DCH "includes the stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high-water line" (50 CFR 226.212). Within the Lost Creek-Boulder Creek Project area, the designated stream reaches include: Boulder Creek to its headwaters, Ant Basin Creek, Bull Horn Creek, Pony Creek, Squirrel Creek, Star Creek Pollock Creek, Yellow Jacket Creek, and two unnamed tributaries upstream and downstream of Twin Forks Creek (Figure FH-3).

Snake River steelhead (*O. mykiss*) are found in the Boulder Creek subwatershed including Boulder Creek and its tributaries Bull Horn Creek and Ant Basin Creek (Figure FH-3). A partial fish passage barrier (natural falls) on Boulder Creek is present at approximately river mile (RM) 4.4 upstream of its confluence with the LSR, but the falls allows passage of steelhead (Petrosky 1984). An adult steelhead was observed in the upper portion of Boulder Creek in 2012 by the New Meadows Ranger District fisheries biologist.. Although *O. mykiss* are found throughout the remaining subwatersheds in the project area, they are not the anadromous form and considered to be resident redband trout. All anadromous species were extirpated from the Weiser River Subbasin by the three-dam Hells Canyon Complex on the Snake River.

Bull Trout

Bull trout (*Salvelinus confluentus*), the Payette NF aquatic Management Indicator Species (MIS), was listed as threatened in 1998 (63 FR 31647). Critical habitat was designated in 2010 (75 FR 63898). Bull trout DCH occurs in the mainstem Little Salmon River downstream of the falls and in tributaries of the Little Salmon River (75 FR 63898). Within the Lost Creek-Boulder Creek Project area, DCH is present in Boulder Creek and Yellow Jacket Creek (Figure FH-4). The final designation of DCH in 2010 by the USFWS did not include any of the streams within the Weiser River subbasin portion of the project area (75 FR 63898). Although DCH was initially proposed in Lost Creek and the West Fork Weiser River in 2004(75 FR 2270), it was not included in the final designation, based in part on bull trout distribution information provided to the USFWS in Nelson and James (2010).

The Draft Bull Trout Recovery Plan was published by the USFWS for the Salmon River Recovery Unit in 2002. The goal of the recovery plan is "to ensure the long-term persistence of self-sustaining, complex interacting groups of bull trout distributed across the species native range, so that the species can be delisted (USFWS 2002)". The Boulder Creek portion of the project area is located within the Little-Lower Salmon River Core area within the Salmon River Recovery Unit. The Draft Recovery Plan outlines actions

that are believed to be necessary to protect and recover the species (USFWS 2002). Of the many recommendations that are contained in the Draft Recovery Plan, the following are addressed by the Lost Creek-Boulder Creek Project:

- Maintaining or improving water quality in bull trout core areas or potential core habitat
- Identification of barriers or sites of entrainment for bull trout and implement tasks to provide passage and eliminate entrainment
- Identification of impaired stream channel and riparian areas and implementation of tasks to restore their functions
- Identification of upland conditions negatively affecting bull trout habitats and implementation of tasks to restore appropriate functions
- Maintaining existing opportunities for gene flow among bull trout populations
- During project planning ensure new projects provide for connectivity within the Salmon River Recovery Unit
- Use of partnerships and collaborative processes to protect, maintain, and restore functioning core areas for bull trout
- Ensure adequate temperature protection for bull trout at all life stages under Idaho Water Quality Standards

The Rocky Mountain Research Station (RMRS) developed a bull trout monitoring protocol in 2010 to provide scientifically defensible bull trout monitoring that could be applied to lands managed by the US Forest Service (Isaak et al. 2010). Although this methodology has not yet been implemented on the Payette NF, the protocol delineates patches of habitat on the Payette NF that have the potential to support bull trout. Patch delineation was modeled by the RMRS using elevation, stream slope and drainage contributing area (Isaak et al. 2010). The RMRS model included patches in the Boulder Creek, Upper Weiser River, Lost Creek and Upper West Fork Weiser River subwatersheds in the project area (Figure FH-4). Within the Boulder Creek subwatershed, patches are present in Bull Horn Creek, Star Creek, Ant Basin Creek and Upper Boulder Creek (including Twin Forks Creek) (Figure FH-4).

Five patches of habitat capable of supporting bull trout were delineated by RMRS in the Weiser River subbasin portion of the project area including Corral Creek (West Fork Weiser River tributary), upper Lost Creek, Butter Gulch (East Fork Lost Creek tributary), East Fork Lost Creek, and the upper West Branch of the Weiser River) (Figure FH-4). It is believed, however, that bull trout do not exist in those areas (see description below).

In the Lost Creek Boulder Creek Project area, bull trout are known to exist only in the Boulder Creek subwatershed within the LSR subbasin (Figure FH-4). Bull trout in the LSR subbasin are not widely distributed due to many migration barriers that exist, including the Little Salmon River Falls located at river mile 21 (at the north end of Meadows Valley), upstream of the mouth of Boulder Creek on the Little Salmon River (Nelson and James 2010). Within the Lost Creek Boulder Creek project area, bull trout are present or likely present (based on recorded fish observations) within Boulder Creek and its tributaries including Star Creek, Yellow Jacket Creek, Twin Forks Creek and Ant Basin Creek (current distribution developed by Nelson et al. 2012) (Figure FH-4). Current fish distribution data in Boulder Creek (Nelson et al. 2012) indicates that bull trout are present or likely to be present in all of the RMRS patches (described above) except the one that contains Bull Horn Creek. Although bull trout have not been documented there, little fish distribution data has been collected within that patch and the presence of bull trout in adjacent

tributaries suggest that bull trout may exist there or may constitute a potential area for expansion. Bull trout are not known to occur in any part of the project area within the Weiser River subbasin (Upper Weiser River, Lost Creek, Upper West Fork Weiser River and Lower West Fork Weiser River subwatersheds). Bull trout distribution in the Weiser River subbasin consists of isolated resident populations in headwater settings (Nelson and James 2010). Within the Weiser River subbasin, populations are only known to exist in the East Fork Weiser River, Little Weiser River, and in the headwaters of Hornet Creek (Idaho Department of Lands). Bull trout are believed to be naturally absent outside of the three areas where they are known to occur (Nelson and Burns 2005, Nelson and James 2010). The current Payette NF bull trout distribution data (Nelson et al. 2012) does not indicate bull trout presence or likely presence anywhere within the Weiser River subbasin portion of the project area, including the patches suggested by RMRS (described above). When Nelson and James (2010) evaluated proposed Critical Habitat in the Weiser River subbasin they determined that "For all practical purposes, we consider bull trout to be naturally absent in the Weiser River system outside the three areas where they are known to occur because there is no conclusive and little anecdotal evidence that they ever occurred elsewhere." From 1989 to 2012, 220 fish surveys (electrofishing and snorkel) have been conducted in the Upper Weiser River, Lost Creek, Upper West Fork Weiser River and Lower West Fork Weiser River subwatersheds and all have failed to detect bull trout (USDA 2013, Fish Inventory Database, Unpublished Data).

Management Indicator Species

The Forest's aquatic Management Indicator Species (MIS) is the bull trout. Bull trout are the only aquatic MIS identified in the Forest Plan (USDA 2003a, page E-3). Distribution of bull trout within the project area is described above. Potential threats to the viability of bull trout on the Payette NF include climate change, watershed development, and invasive species (brook trout) with the latter representing the greatest threat to bull trout populations because of their ability to interbreed (Nelson and James 2010). Brook trout occur concurrently with bull trout throughout Boulder Creek and its tributaries.

Sensitive Species

Westslope cutthroat trout (*Oncorhynchus clarki lewisi*) is a species designated as sensitive by the Regional Forester. Westslope cutthroat are present in the lower part of the Little Salmon River and some of its tributaries downstream of the project area (USDA 2003b), but not known to inhabit any streams within in the project area. Westslope cutthroat do not occur in the Weiser River subbasin which is outside of their historic range.

Other Fish Species

Brook trout (*Salvelinus fontinalis*) and redband/rainbow trout (*Oncorhynchus mykiss*) are widespread throughout the project area. Non-game species such as sculpin (*Cottus spp*.), dace (*Rynichthys spp*.), and redside shiners (*Richardsonius balteatus*) are also present in the project area. Lost Valley Reservoir (located in the Lost Creek subwatershed) is managed as a recreational trout fishery and is frequently stocked by IDFG with catchable sized rainbow trout (IDFG website). It also supports introduced warm-water species such as yellow perch (*Perca flavescens*). Rotenone treatments of Lost Valley Reservoir have been conducted in the past to control yellow perch populations.

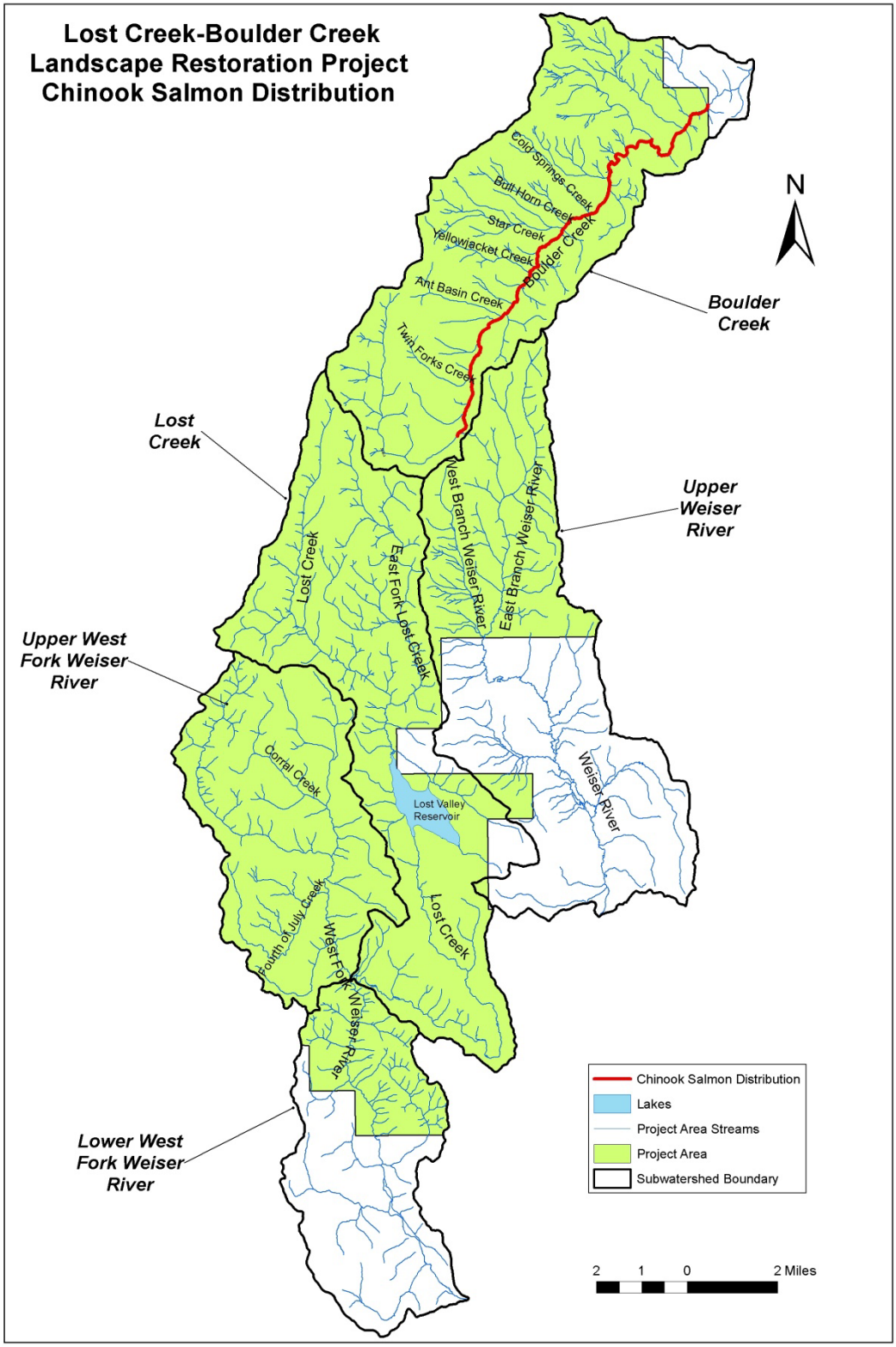


Figure FH-2. Known Chinook salmon Distribution within the Lost Creek-Boulder Creek Project Area. Anadromous species are only found in the Boulder Creek subwatershed.

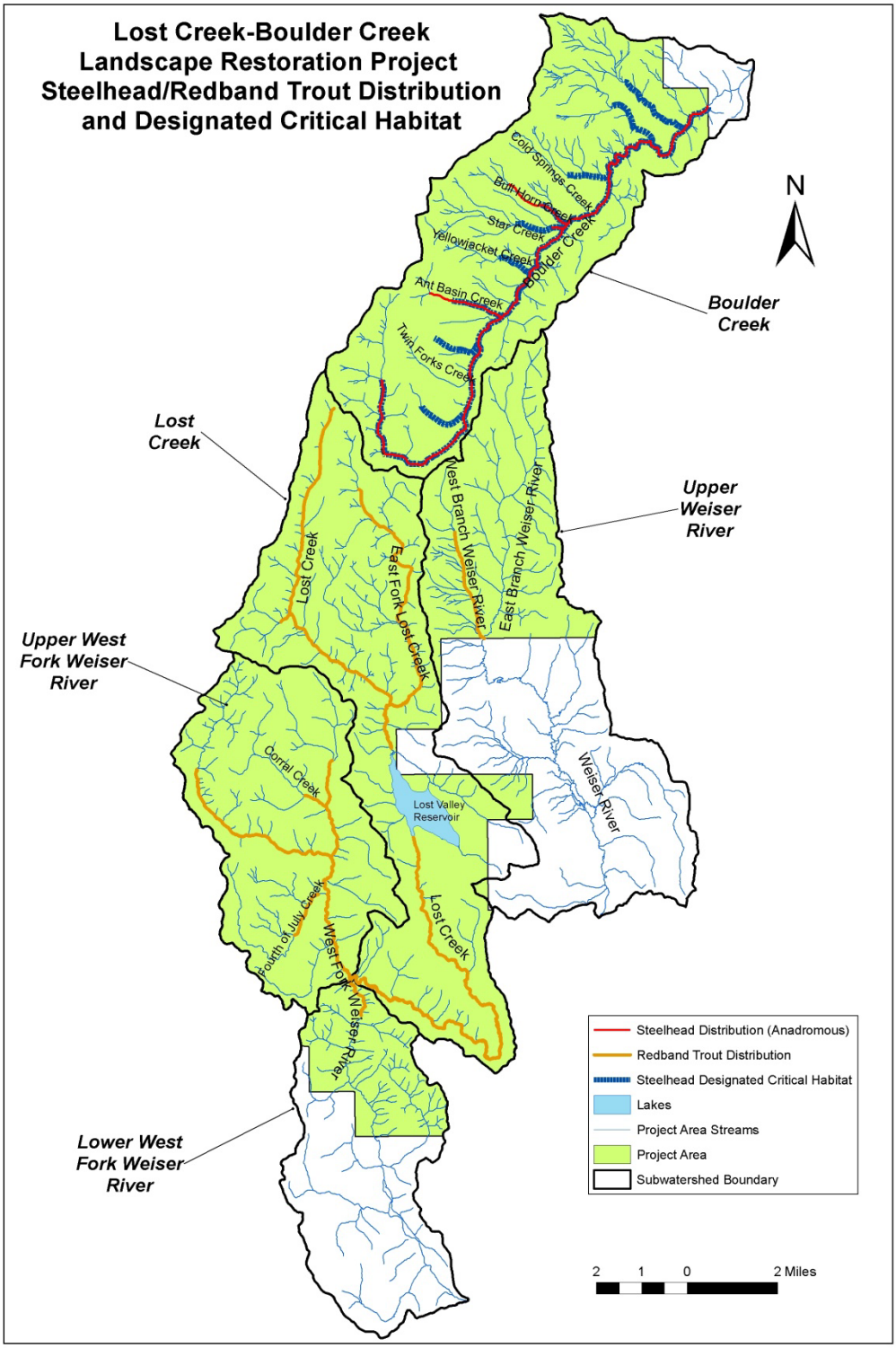


Figure FH-3. Known steelhead/redband trout distribution and DCH in the subwatershed in the Lost Creek-Boulder Creek Project Area (steelhead, the anadromous form of the species, and their DCH are present only in the Boulder Creek subwatershed).

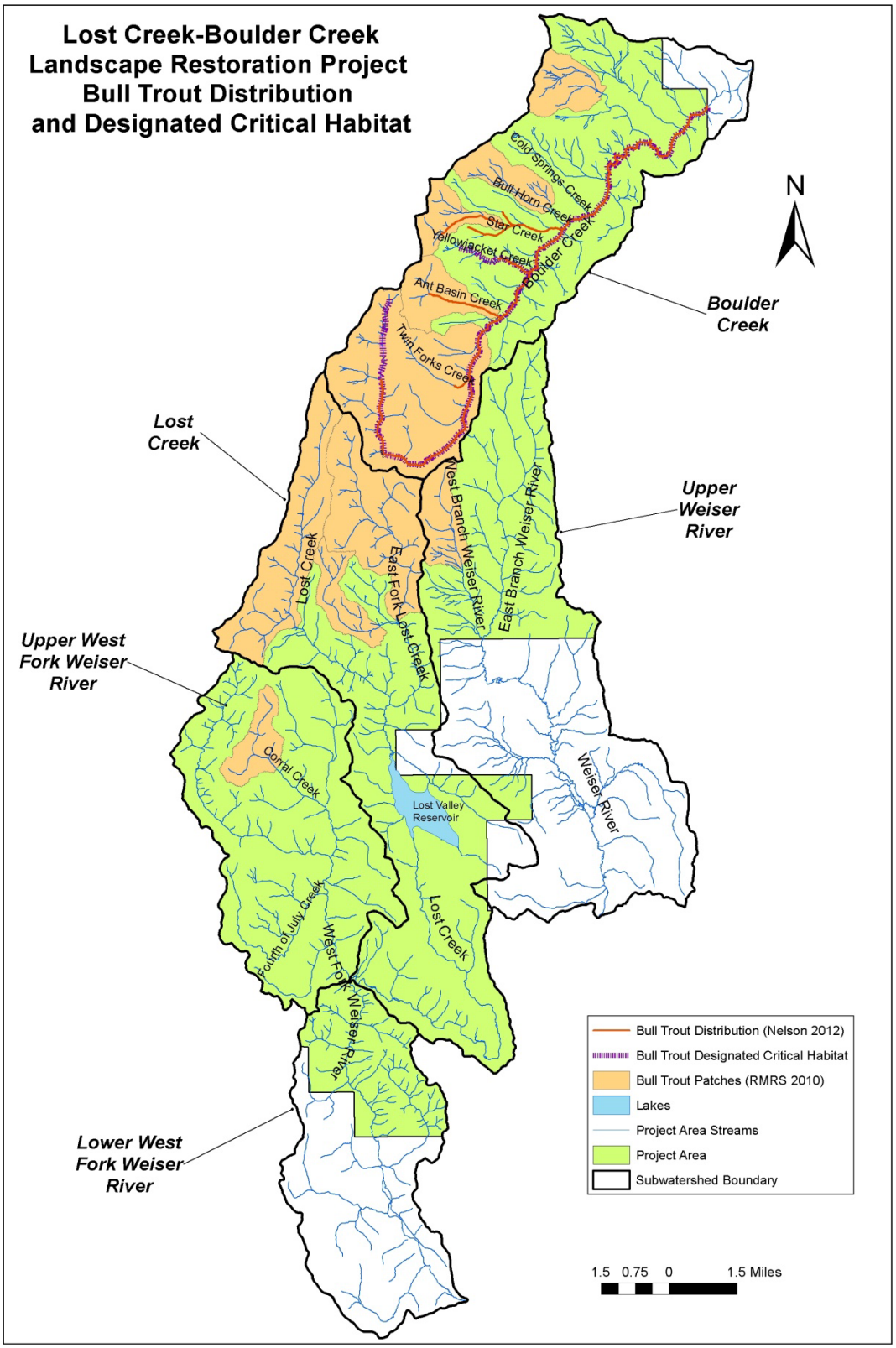


Figure FH-4. Known bull trout distribution in the project area including critical habitat and bull trout patches proposed by the RMRS (Isaak et al. 2010).

Actions that have affected the Current Condition.

A combination of past management actions, including timber harvest, road building, roads in RCAs, livestock grazing, irrigation diversion and development and land management on private property have altered the condition of fish habitat and WCIs in the analysis area. Physical barriers and increased sediment production (primarily from roads) are likely affecting fish habitat within the analysis area.

Fish Habitat and Baseline Data

Fish habitat and distribution data have been collected throughout the analysis area using a variety of inventory methods. R1/R4 (Overton 1997) and/or modified R1/R4 protocol (Nelson et al. 2007), Payette NF surveys based on the PACFISH/INFISH Biological Opinion (PIBO) (Archer et al. 2012) and field visits by fisheries biologist and technician have been used to collect fish and habitat data. Fish distribution data was determined from electrofishing surveys based on Bonar et al. (1997), snorkel surveys based on Thurrow (1994) (either independent, or as parts of other fish habitat surveys and/or project monitoring), IDFG fish data, and other Forest Data on file (USDA Forest Service 2013. Fish Inventory Database, Unpublished Data). Collection locations of fish and fish habitat data considered in this analysis are displayed in Figure FH-5. Stream temperature data has been collected in streams throughout the project area (Figure FH-7) (Unpublished data Payette NF SO, USDA 2013). The Payette NF GIS database was used to calculate project area watershed and treatment acres, road density, road mileages, stream mileages and number of road/stream crossings. Additional baseline information was obtained from the Weiser River and Little Salmon River Biological Assessments for Ongoing Actions (Zurstadt and Burns 2007 and Olson and Burns 2007 respectively). The Little Salmon River Subbasin Review, produced in 2003 (USDA 2003b), also provides estimates of baseline conditions within the Little Salmon River portion of the project area (USDA 2003b). Data were used to assess current fish distribution, baseline habitat conditions and functional levels of appropriate WCIs from the matrices in Appendix B of the Forest Plan (USDA 2003a) (available in the fisheries specialist report in the Project Record). The Lost Creek Boulder Creek Project area was visited numerous times from 2011-2012 by the New Meadows Ranger District fish biologist. Field visits were conducted to collect field data, monitor ongoing project monitoring, and to observe fish and habitat conditions for this and other Forest projects.

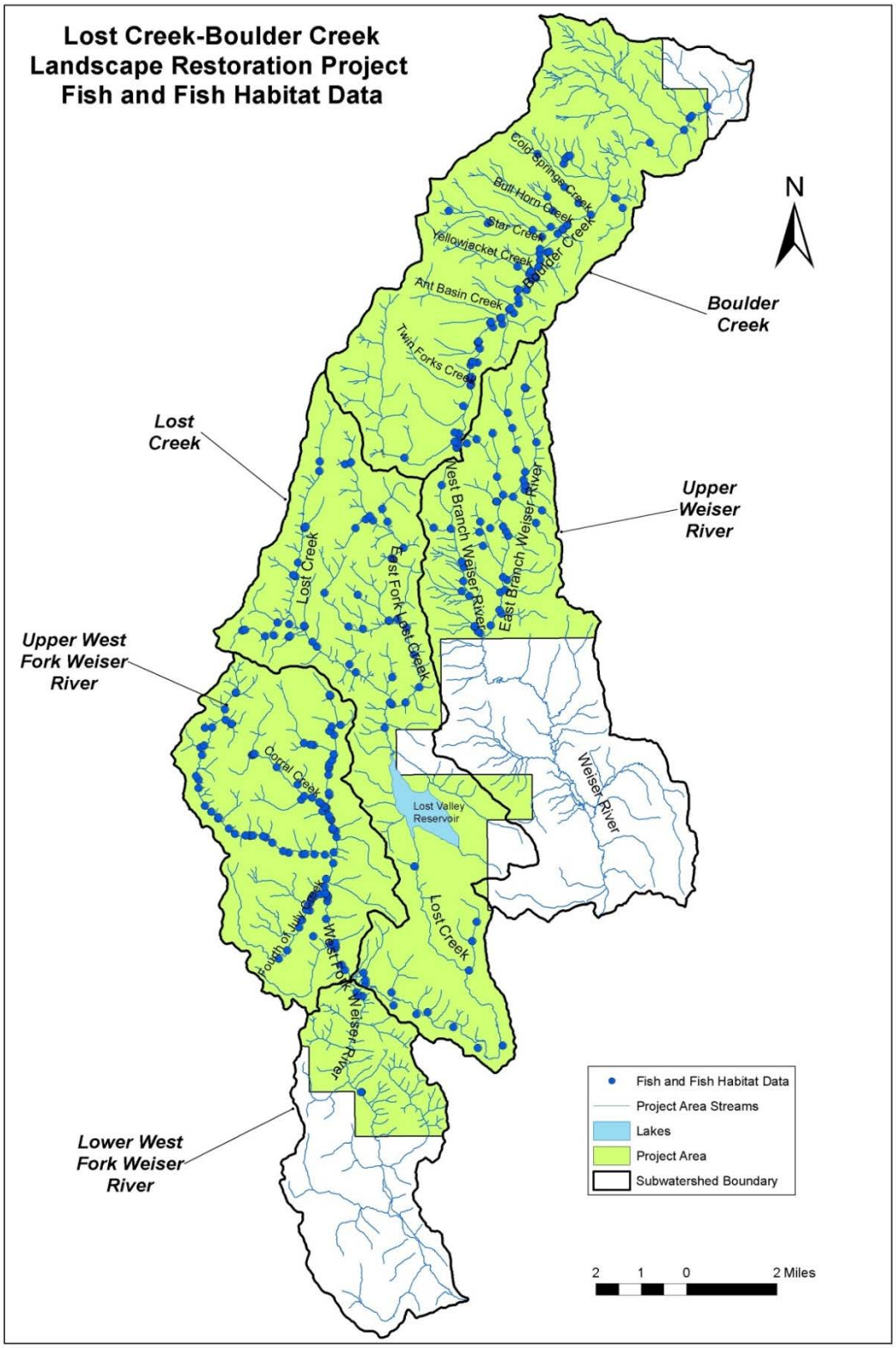


Figure FH-5. Locations of fish and fish habitat data considered in the analysis of the Lost Creek-Boulder Creek Landscape Restoration Project.

Watershed Condition Indicators

Watershed Condition Indicators (WCIs) and the associated matrices in Appendix B (USDA 2003a page B-12) of the Forest Plan were developed to assist managers in identifying baseline conditions and how management actions may influence the condition and trend of SWRA resources and native and desired non-native fish species (USDA 2003a)(Appendix 1 of this document). Forest Plan Appendix B also allows managers to apply functional levels for each WCI: 1) "Functioning Appropriately" (FA) (Desired Condition), 2) "Functioning at Risk" (FR), and 3) "Functioning at Unacceptable Risk" (FUR). An assessment of baseline conditions has been made for all WCIs and is located in Appendix 1 of this document.

This project proposes timber harvest, non-commercial thinning, prescribed fire, vegetation treatments in RCAs (which include commercial thinning and prescribed fire), road decommissioning, road construction and re-construction, culvert installation, culvert replacements and recreation site and infrastructure improvements (see Chapter 2). Ground disturbing activities and culvert replacement activities associated with the proposed action have the potential to affect sediment delivery to stream channels. Removal of trees and vegetation both inside and outside of RCAs has the potential to affect stream shading, thus potentially affecting stream temperatures. Likewise, activities removing trees in RCAs have the potential to affect present and future large woody debris (LWD) recruitment to stream channels. Removal or replacement of fish passage barriers and road decommissioning proposed in the project (see Chapter 2) will re-connect fragmented fish habitat and improve stream channels, RCAs and watershed function.

WCIs most relevant to fish and fish habitat that may be affected by implementation of this project were identified and are described in detail below. Physical Barriers, Road Density/Location, Sediment/Turbidity, Temperature, and LWD WCIs were chosen to provide baseline conditions and to address potential effects that this project may have with regard to fish habitat. Current functional ratings for those WCIs are summarized below in Table FH-3. An assessment of baseline conditions regarding all WCIs referenced in Appendix B of the Forest Plan is located in the Fisheries Specialist Report in the Project Record. Effects matrices for redband trout (Weiser River subbasin) and bull trout have also been completed for the Boulder Creek subwatershed (LSR subbasin), and are located in Appendix 2. Additional analyses of WCIs can also be referenced in the Water Quality Specialist Report (Bailey 2013).

Table FH-3. Current functional ratings for selected WCIs by project area subwatershed (includes only the on-Forest portion of the subwatersheds).

Subwatershed	Temperature	Large Woody Debris	Sediment/ Turbidity	Road Density/Location	Physical Barriers
Boulder Creek	**FR**	**FA**	**FR**	**FUR**	**FUR**
Upper Weiser River	**FR**	**FA**	**FA**	**FUR**	**FUR**
Lost Creek	**FR**	**FA**	**FA**	**FUR**	**FUR**
Upper West Fork Weiser River	**FA**	**FA**	**FR**	**FUR**	**FUR**
Lower West Fork Weiser River	**FR**	**FR**	**FA**	**FR**	**FR**

Physical Barriers WCI

Stream crossings can introduce sediment to stream channels, restrict high flows, plug during runoff events, contribute to road failure and prevent upstream and downstream passage for fish and aquatic organisms. Culverts that are not properly installed can plug with debris during high runoff conditions and fragment habitats (Luce and Wemple 2001; Gibson et al. 2005; Coyler et al. 2005). Passage barriers can also fragment and isolate local fish populations, which can affect gene flow and result in smaller refuge habitat and smaller populations (Reiman and McIntyre 1995; Burns et al. 2005).

The Forest Plan describes the desired condition for Physical Barriers (Table FH-4) as "any man made barriers present in the watershed allow upstream and downstream passage at all flows." Road/stream crossings are numerous in all watersheds within the project area. Numerous fish passage barriers have been identified for improvement (either replacement with an appropriate structure or removal, depending on the proposed road treatment) with this project in each of the subwatersheds in the Lost Creek Boulder Creek Project area (Figure FH-6) (Table FH-5) (see discussion below). Additional passage barriers (not identified in this project analysis) are likely present in each of the subwatersheds. This WCI is considered to be FUR in all of the subwatersheds except the Lower West Fork Weiser River, based on the numerous passage barriers identified throughout the project area (Figure FH-6).

Within National Forest System lands in the Lower West Fork Weiser River subwatershed, no known barriers are present on the mainstem West Fork Weiser River. Although many stream crossings are present on West Fork Weiser River tributaries (most of which are intermittent), these streams are small and likely provide very little, if any fish habitat; therefore this indicator is considered to be FA in this subwatershed. Crossings on FS Road 50127 may be restricting fish passage in the lower parts of tributaries of the West Fork Weiser River, although little fish habitat is isolate by those crossings due to the small size of most streams.

Previous culvert replacements have occurred in the Boulder Creek subwatershed on FS 074 (Smokey Boulder Road) from 2009-2012 on Cold Springs Creek, Bull Horn Creek, Star Creek, Twin Forks Creek, Yellow Jacket Creek, and Ant Basin Creek. These crossings were replaced with open bottom structures designed to provide aquatic organism passage. Many stream crossings in the Boulder Creek subwatershed have been removed on closed system roads to benefit fish passage and watershed function.

Table FH- 4. Functional levels of the Physical Barriers WCI as described in the Forest Plan. The desired condition is the functioning appropriately value.

WCI	Functioning Appropriately	Functioning at Risk	Functioning at Unacceptable Risk
Physical Barriers	Any man-made barriers present in the watershed allow upstream and downstream fish passage at all flows.	Any man-made barriers present in a watershed do not allow upstream and/or downstream fish passage at base/low flows.	Any man-made barriers present in watershed do not allow upstream and/or downstream fish passage at a range of flows.

Table FH-5. Fish passage barriers identified for replacement in the Lost Creek-Boulder Creek Project in each 6th level subwatershed.

Subwatershed	Fish Passage Barriers Identified for Replacement	WCI Rating
Boulder Creek	16	FUR
Upper Weiser River	6	FUR
Lost Creek	11	FUR
Upper WFWR	7	FUR
Lower WFWR	0	FA

Fish passage barriers in the Boulder Creek subwatershed were determined using the Watershed Improvement Needs (WIN) (Kennell and Gabica 2012) report as well as culvert surveys (on file Payette NF SO) and site visits by a fisheries biologist. The 2012 WIN report identified 23 crossings that were considered potential fish passage barriers in that subwatershed (Kennell and Gabica 2012). Of those crossings identified as barriers, fisheries biologists identified 16 of those crossing as the most important fish passage barriers. These crossings were rated as either a Priority 1 or Priority 2 for replacement. Priority 1 crossings were located on streams that are either occupied with listed species or in DCH with abundant suitable upstream habitat. Priority 2 culverts were either in DCH or in streams with upstream habitat for TES and desired native and non-native fish species. Streams that were small or in headwater areas with high gradients were generally considered to be of a lower priority because it is presumed that fish habitat in those streams would be less suitable than the larger, lower gradient streams.

An additional 24 road-stream crossings were identified in the Lost Creek, Upper West Fork Weiser River and Upper Weiser River subwatersheds on larger streams and major tributaries as Priority 2 for replacement to improve aquatic organism passage (Figure FH-6, Table FH-5). Although additional barriers are present in all subwatersheds on unnamed and intermittent stream channels, this project will focus on mainstem fish-bearing streams and tributaries. The dam on Lost Valley Reservoir does not have any means to provide fish passage at this time and separates the upper and lower portions of the Lost Creek subwatershed. Fish passage at the dam is not addressed with this project and is not further discussed.

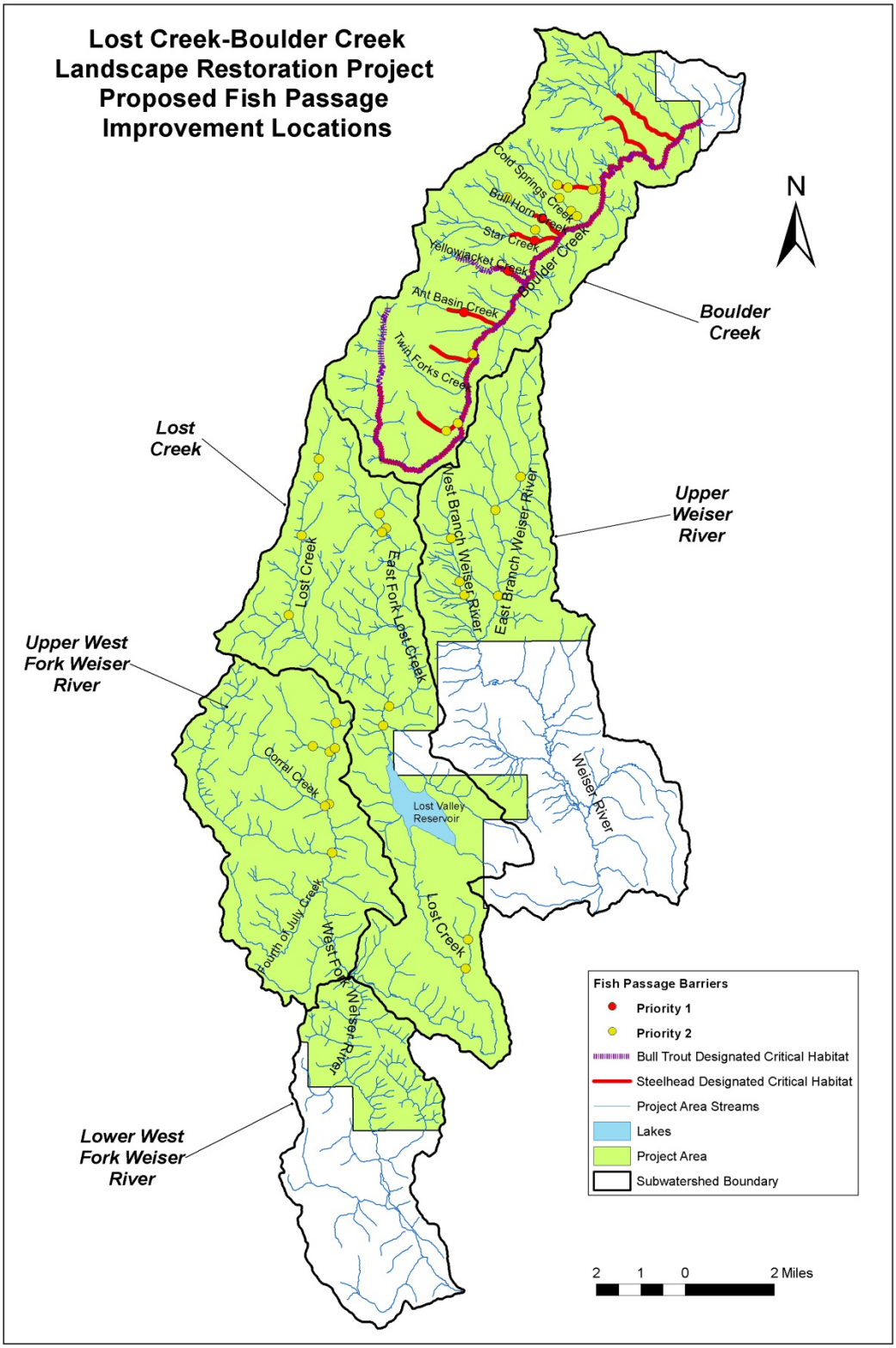


Figure FH-6. Fish passage barriers identified for improvement in the Lost Creek-Boulder Creek Landscape Restoration Project

Road Density/Location WCI

Roads and their effects on streams and fish habitat are well documented. When located in riparian areas, roads can also directly influence a stream's channel and floodplain, alter riparian vegetation decrease large woody debris input and can create passage barriers at stream crossings (Furniss et al. 1991). Within a watershed, roads can alter flow regimes, affect water temperatures, alter channel characteristics, increase the potential of landslide and mass movement, and increase erosion and sedimentation (Furniss et al. 1991 and Gucinski et al. 2001). Roads can increase sedimentation and change the substrate in streams (Quigley and Arbelbide 1997). Nelson et al. (2004) also demonstrated that on the Payette NF, road density appeared to be directly correlated with surface fines. High sediment levels can have many deleterious effects to salmonids and their habitats. Effects of high levels of sediment and substrate embeddedness are further described below.

Table FH-6. Functional levels of the Road Density/Location WCI as described in the Forest Plan. The desired condition is the functioning appropriately value.

WCI	Functioning Appropriately	Functioning at Risk	Functioning at Unacceptable Risk
Road Density/Location	Total road density of <0.7 miles/square mile of subwatershed, no roads within RCAs.	Total road density of 0.7-1.7 miles/square mile of watershed, few roads in RCAs.	>1.7 miles /square mile of subwatershed, many roads within RCAs.

The Forest Plan describes the FA condition as a total road density of less than 0.7 miles per square mile without toads in RCAs (USDA 2003a) (Table FH-6). Within the project area, total road densities range from 1.0 in the Lower West Fork Weiser River to 8.5 in the Upper West Fork Weiser River (Table FH-7) with an overall road density of 5.2 miles per square mile across the entire project area. Table FH-8 displays the RCA road mileage and RCA road density in each of the subwatersheds within the project area and on National Forest System lands. RCA road densities range from 2.13 miles per square mile in the Lower West Fork Weiser River subwatershed to 9.76 miles per mile square in the Upper Weiser River subwatershed (Table FH-7). The Road Density/location WCI is currently Functioning at Unacceptable Risk (FUR) in all of the subwatersheds within the project area except the Lower West Fork Weiser River, which is Functioning at Risk (FR). In the analysis area, roads (discussed in the previous section) have been identified as the primary source of management related sediment (BOISED modeling Percent over Natural) (Section 3.4 in this DEIS and Water Quality Specialist Report (Bailey 2013), available in the Project Record).

Table FH-7. Overall road density (existing conditions) in each of the 6th level subwatersheds in the Lost Creek-Boulder Creek Landscape Restoration Project Area.

Subwatershed	Total Road Density mi/mi^2	Functional Rating
Boulder Creek	**3.1**	**FUR**
Upper Weiser River	**4.7**	**FUR**
Lost Creek	**6.9**	**FUR**
Upper West Fork Weiser River	**8.5**	**FUR**
Lower West Fork Weiser River	**1.0**	**FR**

Table FH-8. RCA road density in each of the 6th level subwatersheds in the Lost Creek-Boulder Creek Landscape Restoration Project Area.

Subwatershed	RCA Road Mileage*	RCA Road Density* mi/mi^2
Boulder Creek	**28.96**	**2.78**
Upper Weiser River	**34.13**	**9.76**
Lost Creek	**54.54**	**6.57**
Upper West Fork Weiser River	**31.71**	**7.25**
Lower West Fork Weiser River	**4.6**	**2.13**

*Includes only system roads

Sediment/Turbidity WCI

High levels of fine sediment in streams can have many deleterious effects to salmonids and their habitats. Fine sediment can reduce the quality of habitat by filling in pools and interstices in the substrate that provide cover and refugia from streamflow. As a higher amount of fines occurs in the substrate, salmonid populations can be negatively affected (Reiser and Bjornn, 1979). High levels of fines can affect embryo incubation, decrease fry emergence and reduce embryo survival (Reiser and Bjorrn 1979). When spawning gravel exceeds approximately 20 percent fines, trout embryo survival begins to sharply decrease (McCuddin 1977, Chapman and McLeod 1987). Suttle et al. (2004) found that steelhead growth decreased as sediment levels increased, which was consistent with a shift of available prey organisms to unavailable burrowing species. Harvey et al. (2009) observed reduced survival of rainbow trout when habitat complexity was decreased as a result of an increase in sediment in riffles that decreased habitat complexity.

Potential sources of current sediment production across the analysis area are existing roads (including decommissioned roads from recently completed projects such as Upper Weiser River Fire Regime/Condition Class Treatment project, and East Fork Lost Creek NIDGS Habitat Improvement Project), past and ongoing timber harvest, livestock grazing, and land management activities on private and State property, including roads, grazing, timber harvest, agricultural practices and housing developments.

Appendix B of the Forest Plan describes a FA (desired) condition for sediment/turbidity condition as less than 12 percent surface fines for steelhead, Chinook salmon, and in areas of bull trout spawning and rearing (Table FH-9). Steelhead, Chinook and bull trout are present in the Boulder Creek subwatershed. Using Forest Plan criteria, the sediment/turbidity WCI is FR in the Boulder Creek subwatershed based on survey data (Table FH-10) (USDA Forest Service 2013. Fish Inventory Database, Unpublished Data).

Outside Boulder Creek subwatershed, anadromous species and bull trout are absent in the project area. The Forest Plan recommends developing species specific criteria for other fish species (such as redband/rainbow trout). To assess baseline conditions in the subwatersheds where listed species are absent (all subwatersheds excluding Boulder Creek), methods similar to those used in the Mill Creek-Council Mountain Landscape Restoration Project were used (Giambra 2012). The FA criteria use the Natural Conditions database (Overton et al. 1995) and defined the FA (desired) condition as surface fines less than 27 percent (with a standard deviation of 21) for volcanic “B” channel streams. Using the criteria from Overton et al. the Sediment/Turbidity WCI is FA in the Upper Weiser River, Lost Creek, and Lower West Fork Weiser River subwatersheds. The Upper West Fork Weiser River is FR (Table FH-10).

Table FH-9. Forest Plan Watershed condition indicator for Sediment/turbidity.

WCI	Functioning Appropriately	Functioning at Risk	Functioning at Unacceptable Risk
Sediment/turbidity (steelhead, chinook)	Low turbidity is indicated by <12% surface fines (<0.85mm)	Moderate turbidity is indicated by 12-20% surface fines (<0.85mm)	High turbidity is indicated by >20% surface fines (<0.85mm)
Sediment/turbidity (in areas of spawning and incubation)(bull trout)	<12% fines (<0.85mm) in gravel, Surface fines (≤ 6mm ≤ 12%)	12-17% fines (<0.85mm) in gravel, Surface fines (≤ 6mm) are 12-20%.	>17% fines (<0.85mm) in gravel; Surface fines (<6mm) or depth fines >20% in spawning habitat.
Sediment/turbidity (other species: *i.e.* redband/rainbow wood river sculpin)	< 27% surface fines (Overton et al 1995)	> 27% surface fines (Overton et al 1995)	

Table FH-10. Environmental baseline for watershed condition indicator Sediment/Turbidity in the Lost Creek-Boulder Creek project area

6th Level Subwatershed	Stream Names	Desired Conditions	Baseline conditions	Functional Rating
Boulder Creek	Boulder Creek Cold Springs Creek Bull Corral Creek	<12% (in areas of bull trout spawning and rearing,)	Average surface fines **21.9%**	**FR**
Upper Weiser River	E. Branch Weiser River W. Branch Weiser River and Tributaries	<27%, other species (Overton et al 1995)	Average surface fines **26.2%**	**FA**
Lost Creek	Lost Creek and Tributaries East Fork Lost Creek and Tributaries Bear Gulch	<27%, other species (Overton et al 1995)	Average surface fines **25.02%**	**FA**
Upper West Fork Weiser River	West Fork Weiser River Sheep Creek Corral Creek	<27%, other species (Overton et al 1995)	Average surface fines **27.19%**	**FR**
Lower West Fork Weiser River	West Fork Weiser River	<27%, other species (Overton et al 1995)	Average surface fines **16.5%**	**FA**

Desired conditions are WCI "Functioning Appropriately" values from the Forest Plan (USDA 2003a) or conditions described by Overton et al. (1995) (unpublished data, Payette NF Fisheries Database, Payette NF Supervisor's Office).

Temperature WCI

Stream temperatures are the result of physical factors including insolation, air temperature, relative humidity, groundwater input, substrate composition, discharge rate and reach length (Cross 2002). Cross (2002) regarded the first four as the most important, but all factors work together and uniquely in an individual stream. The primary factor that influences temperatures in the summer is direct solar radiation (Betscha et al. 1987; Chamberlin et al. 1991; Johnson 2004). Riparian vegetation maintains stream temperatures and as shade increases, water temperature decreases (Murphy and Meehan 1991). Removal of this streamside and overhanging vegetation, including the forest canopy, can increase insolation during summer months, resulting in elevated water temperatures, and, conversely the removal of insulating vegetation in the winter can result in colder winter temperatures.

Water temperature influences the metabolism, behavior, and mortality of fish and other organisms in their environment (Mihursky and Kennedy 1967). Fish can often weather short durations of temperatures above or below their preferred range, and although fish may survive at temperatures near the extremes of their suitable range, growth is reduced at low temperatures because all metabolic processes are slowed, and at high temperatures because most or all food must be used for maintenance (Bjornn and Reiser 1991).

The desired condition for temperature WCIs in the Forest Plan is based on anadromous species (Chinook salmon and steelhead) and bull trout, which occur in Boulder Creek and some of its tributaries. The desired conditions in Boulder Creek will be evaluated using the criteria for bull trout because it is the most restrictive (USDA 2003) (Table FH-11). The desired conditions for bull trout are a maximum weekly (7-day average) mean temperature (MWMT) of in a reach during the following life history stages: incubation, 2-5°C, Rearing 4-12°C, and spawning 4-9°C.

Temperature criteria for other fishes were not developed in the Forest Plan. Nelson and Burns (2007) proposed temperature WCIs specific to redband trout (Table FH-11). This temperature criterion will be used for all subwatersheds in the Weiser River Subbasin portion of the analysis area because bull trout (and anadromous species) are not present and it is likely more appropriate for the resident species (redband trout) found there. In the Weiser River subbasin, stream temperature for redband trout spawning is not a concern because they spawn in the spring when water temperatures are low, and likely not for brook trout, which spawn in the fall as stream temperatures are cooling. However, high stream temperatures can affect rearing habitat for both species and excessive cooling in winter could reduce overwintering habitat redband trout and incubating brook trout embryos.

Temperature data are not available for all streams in the analysis area . Project area temperature monitoring sites are displayed in Figure FH-7. Temperature data considered in this analysis include: Boulder Creek (3 sites), East Branch Weiser River, (2 sites), West Branch Weiser River (2 sites), Lost Creek (5 sites), East Fork Lost Creek (3 sites), and West Fork Weiser River (3 sites)..

Boulder Creek and its tributary Yellow Jacket Creek are bull trout DCH and identified as spawning and rearing habitat for bull trout (FWS 2010). The average of MWMTs at three monitoring sites in Boulder Creek was 16.4°C during years when data were collected, which exceeds the FA criteria for bull trout spawning, rearing, and in areas used by migrating adults (Table FH-11). MWMTs were cooler during the bull trout spawning period, although temperatures exceeded spawning criteria (10°C) at all sites during the first part of the spawning period in 2012 (unpublished data on file, Payette NF). On the Payette NF, the bull trout spawning period begins approximately August 15 and extends into late September (Adams 1994; Hogen and Scarnecchia 2001; Watry and Hogen 2002). Tributaries of Boulder Creek are well shaded (Olson and Burns 2007) and are expected to have stream temperatures lower than those recorded in the mainstem of Boulder Creek. Based on recorded stream temperatures and professional judgment, stream temperatures are judged to be FR in the Boulder Creek subwatershed. Previous analyses in Olson and Burns (2007) judged stream temps in Boulder Creek to be FA, based on adequate shading of tributary streams. That rating is updated in this document because recorded stream temperatures regularly exceed the FA criteria at all of the sites where temperature data is collected and the subwatershed average also exceeds the FA criteria.

The temperature criteria for redband trout proposed by Nelson and Burns (2007) were used in the remainder of the project area (Table FH-11). In the Upper Weiser River subwatershed, stream temperatures are FA (Table FH-11). Temperatures are FR in Lost Creek, Upper West Fork Weiser River

and Lower West Fork Weiser River (Table FH-11). A TMDL for temperature is in place on the West Fork Weiser River (IDEQ 2010) and further described in the Watershed Specialist Report (located in the project record). Stream temperatures in the Lost Creek subwatershed were analyzed separately upstream and downstream of Lost Valley Reservoir. Lost Valley Reservoir increases water temperatures downstream of the reservoir. Using the temperature criteria for redband trout (Nelson and Burns 2007), Lost Creek is FR upstream of the reservoir due to temperatures lower than the desired range, and also FR downstream of the reservoir due to temperatures that exceed the desired range. Therefore the watershed (in its entirety) was judged to be FR.

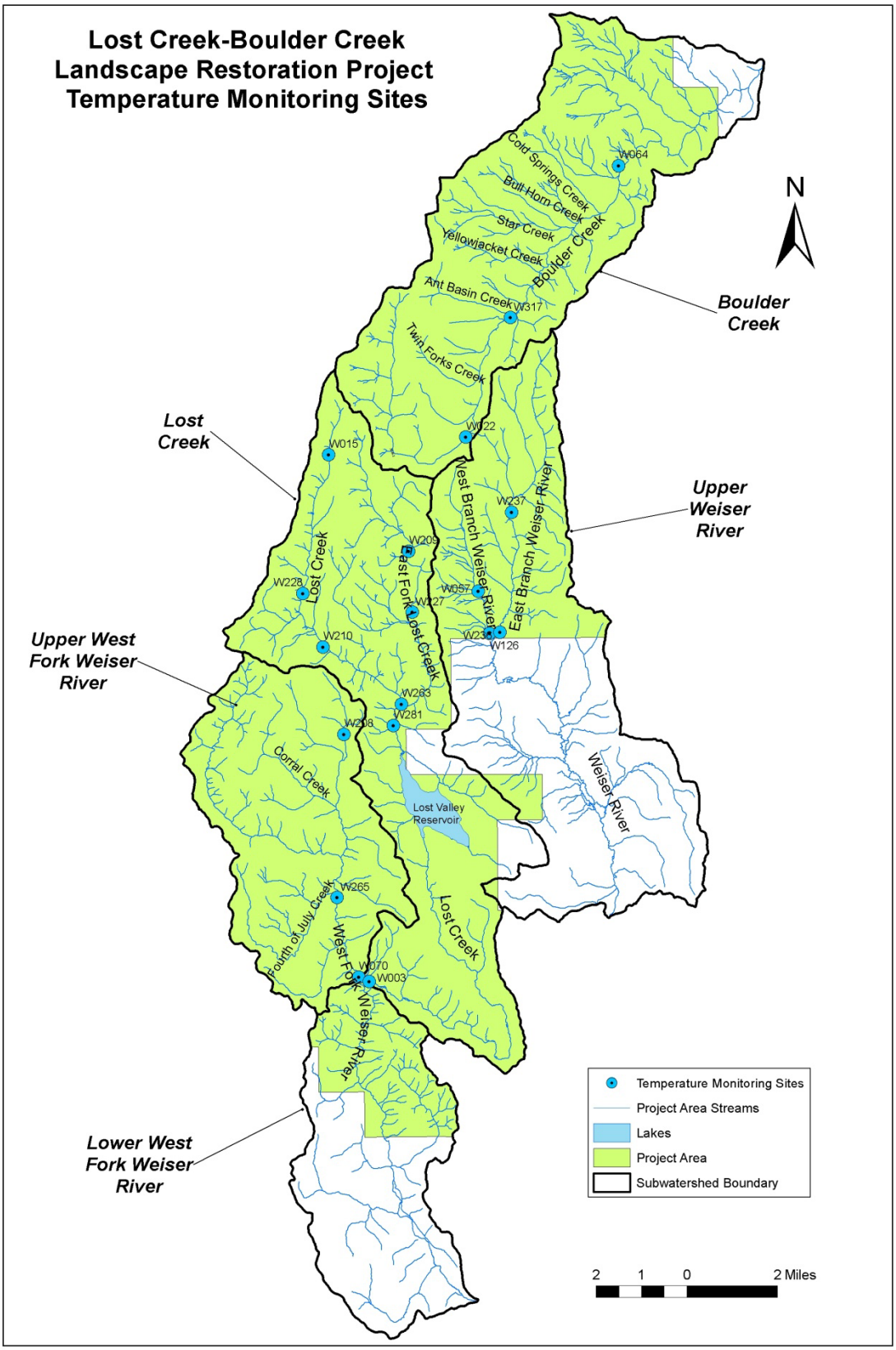


Figure FH-7. Temperature monitoring sites within the Lost Creek-Boulder Creek Landscape Restoration Project.

Table FH-11. Forest Plan Watershed Condition Indicators for temperature, including temperature criteria for steelhead and chinook, bull trout and criteria for redband trout proposed by Nelson and Burns, 2007.

WCI	Functioning Appropriately	Functioning at Risk	Functioning at Unacceptable Risk
Temperature (steelhead, chinook)	7-day average maximum. Spawning, rearing, and migration: 50-57°F (10-13.9°C)	Spawning: 57-60°F (13.9-15.5°C) Migration and rearing: 57-64°F	Spawning: >60°F (>15.5°C) Migration and rearing: >64°C (17.7°C)
Temperature (bull trout)	7-day maximum temperature in a reach during the following life history stages: Incubation: 2-5°C Rearing: 4-12°C Spawning: 4-9°C Also Temperatures do not exceed 15°C or 59.0°F in areas used by adults during migration (no thermal barriers).	7-day average maximum temperature in a reach during the following life history stages: Incubation: <2 or 6°C Rearing: <4C or 13-15°C Spawning: <4C or 10°C Also temperatures in areas used by adults during migration sometimes exceed 15°C or 59°C	7-day average maximum temperature in a reach during the following life history stages: Incubation: <1°C or >1°0C Rearing: >15°C or 59.0°F Spawning: <4°C or >10°C Also temperatures in areas used by adults during migration regularly exceed 15°C or 59°C(thermal barriers present)
Redband Trout* (All Life Stages)	Summer MWMT: 17°C-20°C	Summer MWMT: >20°C and ≤27°C or <17°C and ≥15°C	Summer MWMT: >27°C or <15°C

*Nelson and Burns, 2007. Temperature values tentative; additional data at extreme temperatures are needed (especially at cold temperatures).

Table FH-12. Environmental baseline for watershed condition indicator Temperature in the Lost Creek-Boulder Creek Landscape Restoration Project Analysis area; desired conditions are WCI "Functioning Appropriately" values from the Forest Plan (USFS 2003) or criteria for redband trout proposed by Nelson and Burns 2007.

6th Level Subwatershed	Desired Conditions	Current conditions (MWMT)	Functional Rating
Boulder Creek	7-day maximum temperature(MWMT) in a reach during the following life history stages: Incubation: 2-5°C Rearing: 4-12°C Spawning: 4-9°C Also Temperatures do not exceed 15C or 59.0F in areas used by adults during migration (no thermal barriers).	**Subwatershed Average MWMT 16.64°C**	**FR**
Upper Weiser River	Summer MWMT: 17°C-20°C	**Subwatershed Average MWMT 17.95°C.**	**FA**
Lost Creek		**Average MWMT upstream of Lost Valley Reservoir 16.04°C** **Average MWMT downstream of the reservoir 22.36°C**	**FR**
Upper West Fork		**Subwatershed Average MWMT**	**FA**

6th Level Subwatershed	Desired Conditions	Current conditions (MWMT)	Functional Rating
Weiser River		**17.73°C**	
Lower West Fork Weiser River		Temperature data has not been collected in this subwatershed. Temperatures collected at sites immediately upstream of this subwatershed (W003 andW070) typically record MWMTs that exceed 20°C. Based on upstream temperatures and professional judgment, this WCI is considered to be FR. A TMDL for temperature is also in place (IDEQ 2010)	**FR**

Large Woody Debris WCI

Large woody debris (LWD) is an important biological and physical component in forested stream ecosystems (McDade et al. 1989). Large woody debris is an important source of cover and habitat for fish in streams and influences stream channel formation, pool formation, and sediment transport and deposition (Sullivan et al. 1987, MacDonald et al. 1991). McDade et al. (1989) found that most large woody debris originates in areas immediately adjacent to the stream channel. This indicates that management in RCAs has the most potential to directly affect this WCI.

The desired condition (FA) described in the Forest Plan for LWD is at least 20 pieces of LWD per mile that exceed 12 inches (0.3m) in diameter and 35 feet (10.6m) in length, and adequate sources of large woody debris for both long and short-term recruitment (Table FH-13). LWD data collected in the analysis area were also compared to natural conditions described by Overton et al. (1995) which will also be considered here to represent the desired condition for LWD. LWD parameters were used for “A,” “B” and “C” channels with volcanic geology (Overton et al. 1995), which is generally representative of the project area. Stream habitat inventories have consistently collected LWD data for pieces of LWD that are smaller than those described in the Forest Plan but are consistent with the natural conditions described by Overton et al. (1995) (10cm in diameter by three m in length).

LWD data has been collected throughout the analysis area as part of R1/R4 Fish Habitat Inventories (Overton et al. 1997), Payette National Forest Fish and Habitat Inventory Surveys (Nelson et al. 2007), surveys based on the PACFISH-INFISH Biological Assessment (PIBO) (Archer et al. 2012) or other habitat assessments (using R1R4 and/or Payette NF Inventory methods) (USDA Forest Service 2013 Fish Inventory Database, Unpublished Data). LWD data is summarized in Table FH-14.

The Boulder Creek, Upper Weiser River, Lost Creek and the Upper West Fork Weiser River subwatersheds exceed both the Forest Plan desired conditions for LWD (as well as natural conditions described by Overton et al. (1995) and are considered to be FA (Table FH-14). Data collected in the Lower West Fork Weiser River recorded an average of eight pieces per mile (in 2 sites) and four pieces per 100m (in three sites) using the Forest Plan and Natural Conditions LWD criteria, respectively. Both of these values are lower than the desired conditions (Forest Plan and Overton et al. 1995, respectively), although adequate recruitable LWD appears present throughout the Payette NF portion of that subwatershed. Based on the data collected and professional judgment, LWD levels are considered to be FR in the Lower West Fork Weiser River.

Table FH-13. Forest Plan Watershed Condition Indicators for Large Woody Debris. Also includes LWD Natural Conditions described by Overton et al (1995).

WCI	Functioning Appropriately	Functioning at Risk	Functioning at Unacceptable Risk
Large Woody Debris	**Forest Plan:>20 pieces per mile, >12 inches in diameter, >35 feet length**; and adequate sources of large woody debris for both long and short-term recruitment	Currently meets standards for functioning appropriately, but lacks potential source of short or long term large woody debris recruitment from RCAs to maintain that desired condition.	Does not meet the standards for functioning appropriately and lacks potential large woody debris for short and/or long-term recruitment
	Natural Conditions Database (Overton et al 1995) #pieces/100m >0.1m diameter 3.0m Length **A Channel Volcanic** Wetted Width #LWD/100m 0-1.5 NA 1.5-3 NA 3-4.7 5.03 4.7-6 3.41 **B Channel Volcanic** Wetted Width #LWD/100m 1.5-3 4.16 3-4.7 12.22 4.7-6 12.82 10.7-12.2 4.03 **C Channel Volcanic** Wetted Width #LWD/100m 1.5-3 0.38 3-4.7 3.91 4.7-6 4.25	Pieces >0.1 in diameter and 3.0m in length fewer than described, and insufficient recruitable LWD.	

Table FH-14. Environmental baseline for watershed condition indicator Large Woody Debris in the Lost Creek-Boulder Creek Landscape Restoration Project Analysis area; desired conditions are WCI "Functioning Appropriately" values from the Forest Plan (USFS 2003) or Natural Conditions described by Overton et al. (1995)(Unpublished data on file, Payette National Forest Supervisor's Office).

6th Level Subwatershed	Streams Surveyed	Environmental Baseline	Functional Rating
Boulder Creek	Boulder Creek	Forest Plan criteria-**37.6 pieces per mile** average in surveyed streams. Values ranged from 0-127 pieces per mile over 17 sites (approximately 7789m) surveyed.	**FA**

6th Level Subwatershed	Streams Surveyed	Environmental Baseline	Functional Rating
Upper Weiser River	East Branch Weiser River Tributary of East Branch Weiser River West Branch Weiser River	Forest Plan criteria-**41.7 pieces per mile** average in surveyed streams. Values ranged from 0-243 pieces per mile over 21 sites (approximately 3870m) surveyed. Overton *et al*. (1995) criteria-**16.2 pieces per 100m**. Values ranged from 2.18-31.9 pieces per100m over 20 sites surveyed (approximately 3870m) with an average stream width of 2.81m.	**FA**
Lost Creek	Lost Creek Tributary of Lost Creek Bear Gulch East Fork Lost Creek Tributary of East Lost Creek	Forest Plan criteria-**45.1 pieces per mile** average in surveyed streams. Values ranged from 0-160 pieces per mile over 16 sites (approximately 1967m) surveyed. Overton *et al*. (1995) criteria-**19.6 pieces per 100m**. Values ranged from 2.18-31.9 pieces per 100m over 20 sites surveyed (approximately 2833m) with an average stream width of 2.81m.	**FA**
Upper West Fork Weiser River	West Fork Weiser River Grouse Creek Sheep Creek Corral Creek Fourth of July Creek	Forest Plan criteria-**28.9 pieces per mile** average in surveyed streams. Values ranged from 0-91.6 pieces per mile over 27 sites (approximately 3443m) surveyed. Overton *et al*. (1995) criteria- **17.7pieces per 100m**. Values ranged from 4.6-49.0 pieces per 100m over 27 sites surveyed (approximately 3443m) with an average width of 2.16m.	**FA**
Lower West Fork Weiser River	West Fork Weiser River	**Forest Plan criteria-8 pieces/mi** in surveyed streams. Values ranged from 1-15.9 over 2 sites (approximately 471m) surveyed. Overton et al. (1995) criteria-**4.19 pieces per 100m** in 3 sites surveyed (approximately 826m surveyed) with and average width of 10.78m.	**FR**

SWRA Restoration Objectives

Restoration activities associated with each of the proposed alternatives are described in Chapter 2 this DEIS (section 2.3, Alternatives Described in Detail).

Objectives

The Lost Creek-Boulder Creek Project proposed action and Chapter 1 of the Lost Creek Boulder Creek DEIS identify that one purpose of the project is to "move all watersheds within the project area toward SWRA desired conditions and improve the Boulder Creek subwatershed from the "impaired" category to the "functioning at risk" category as described in the Watershed Condition Framework (Potyondy and Geier 2010), with an emphasis on: 1) Restoring habitat connectivity, especially in streams occupied by ESA listed fishes and in DCH, and 2) Reducing road-related accelerated sediment and other road related

impacts". Actions associated with each of the proposed alternatives are described in Chapter 2 of the Lost Creek-Boulder Creek DEIS.

Measurements

- Number of stream crossings improved (either removed or replaced) to specifically improve fish passage.
- Road density/Location by subwatershed
- Stream miles improved (including miles of fish habitat re-connected and miles of stream enhanced through road decommissioning and other treatments.

Restoration of Habitat Connectivity

Stream Crossing Improvements

Table FH-15 displays the number of stream crossings identified as important fish passage barriers proposed for improvement to restore fish habitat connectivity. Crossings would be improved to provide fish passage by either removal or replacement based on the proposed treatment for that road (e.g. a barrier identified on a road proposed for decommissioning or long-term closure would be removed, whereas a barrier on a road proposed to remain on the system would be replaced with an appropriate structure). Proposed culvert improvements for each of the four action alternatives, including locations (Figure FH-6), are described in Chapter 2 of the Lost Creek-Boulder Creek DEIS.

Table FH-15. Number of proposed crossing improvements and miles of connectivity restored in each project area subwatershed.

Subwatershed	ALT A		ALT B		ALT C		ALT D		ALT E	
	Number	Miles Improved	Number	Miles Improved	Number	Miles Improved	Number	Miles Improved	Number	Miles Improved
Boulder Creek	0	0	16	15.3	16	25.4 [1]	16	15.3	16	15.3
Upper Weiser River	0	0	6	10.7	6	10.7	6	10.7	0	0
Lost Creek	0	0	11	23.6	11	23.6	11	23.6	0	0
Upper West Fork Weiser River	0	0	7	7.7	7	7.7[2]	7	7.7	0	0
Lower West Fork Weiser River	0	0	0	0	0	0[2]	0	0	0	0
Totals	**0**	**0**	**40**	**57.3**	**40**	**67.0**	**40**	**57.3**	**16**	**15.3**

[1] Additional miles improved is a result of decommissioning a portion of FS 50158.

[2] An incremental increase in habitat connectivity is expected with the proposed road re-route of FS 127 along the West Fork Weiser River in Alternative C.

Alternative A (no action) does not address any stream crossings identified as fish passage barriers. No improvements to fish passage would occur in the Project Area as a result of this project and therefore would not meet the SWRA restoration objective of the project.

Alternatives B and D each address the 40 stream crossings identified as fish passage barriers across the project area. Sixteen crossings would be improved in the Boulder Creek subwatershed. Five of those crossings would be removed when roads are decommissioned and 11 would be replaced with an appropriate structure. Three crossings in the Boulder Creek subwatershed would be improved on streams that are known to be occupied with bull trout or in bull trout DCH (Figure FH-4). Ten crossings within the Boulder Creeks subwatershed would be improved on stream that are occupied with Steelhead or on Steelhead DCH. Twenty-two of the 24 crossings identified as passage barriers elsewhere in the project area

would be replaced with appropriate structures. Listed species and DCH are not located outside of the Boulder Creek subwatershed.

Alternative C addresses the 40 crossings across the project area described in the proposed action (Alternative B). Appropriate structures would be required at 4 crossings in the Boulder Creek subwatershed; the remaining 12 would be removed through proposed road decommissioning. An additional 7 crossings on perennial streams (that are not identified as a priority for restoration with this project) would also be removed in Alternative C with proposed decommissioning of a portion of FS 50158 (Chokecherry Flat Road), which would connect the headwater areas of Star Creek, the North Fork Star Creek, Bull Horn Creek, Cold Springs Creek and Pollock Creek. Culvert removal along FS 50158 may not directly improve fish passage because stream crossings are near the headwaters (small and relatively steep) and may provide little fish habitat. Improvements to fish passage in streams with listed fishes and DCH would be identical to that in Alternatives B and D. Twenty-two of the remaining 24 stream crossing outside of the Boulder Creek subwatershed would be replaced with appropriate structures.

Alternative E would address only the 16 stream crossings identified as fish passage barriers in the Boulder Creek subwatershed as described in alternatives B and C above. This alternative meets the objective to improve habitat connectivity, but focusses only in the Boulder Creek subwatershed with 16 culvert improvements to restore habitat connectivity. Improvements to fish passage in streams with listed fishes and DCH would be identical to that in Alternatives B and D.

Reduction of road-related sediment and other road-related impacts

Road Density/Location

The BOISED model (Reinig et al. 1991) has identified roads as the primary cause of management-related sediment production in all of the subwatersheds across the project area (Watershed specialist report). Road decommissioning proposed in all of the action alternatives is expected to result in long term sediment reduction across the project area. Road treatments are described for each of the alternatives in Chapter 2 of the Lost Creek-Boulder Creek FEIS. Resulting road densities (including RCA road densities) are displayed in Table FH-16 (below).

Table FH-16. Road Density/Location by subwatershed.

Subwatershed	Alternative A (Existing Cond)		Alternative B		Alternative C		Alternative D		Alternative E	
	Total Road Density	RCA Road Density*	Total Road Density	RCA Road Density*	Total Road Density	RCA Road Density*	Total Road Density	RCA Road Density*	Total Road Density	RCA Road Density*
Boulder Creek	3.1	2.8	2.0	1.9	1.1	1.2	2.0	1.9	2.0	1.9
Upper Weiser River	4.7	9.8	3.6	6.9	2.8	5.9	3.6	7.0	3.8	8.5
Lost Creek	6.9	6.6	5.3	5.8	4.8	5.7	5.3	5.8	5.5	6.0
Upper West Fork Weiser River	8.5	7.3	6.8	6.6	5.8	5.4	6.8	6.6	7.0	7.0
Lower West Fork Weiser River	1.0	2.1	1.0	2.3	0.5	1.9	1.0	2.3	1.1	2.5

*Includes system roads only.

Alternative A (the no-action alternative) does not propose road decommissioning. Road-related sediment production and other road related effects, such as impairment of stream channels and floodplains,

reductions in stream shading and riparian vegetation and LWD recruitment would be maintained at the current level. Alternative A does not address the SWRA objective identified for this project.

Alternatives B, C, D, and E (action alternatives) would result in a temporary to short-term increase, (caused by vegetation treatments, prescribed fire, road use and road decommissioning) followed by a long-term decrease in sediment production (resulting from the reduction of road density) in all of the subwatersheds in the project area. Predicted BOISED sediment production for all of the action alternatives is described in Section 3.4.6 (below). All action alternatives would address the objectives of road-related sediment reduction, with the most benefit (long-term sediment reduction) realized (all subwatersheds) in Alternative C. Effects of proposed project activities on sediment production are described below. RCA road decommissioning associated with all of the action alternatives would also incrementally improve stream channels and floodplains, stream shading, riparian vegetation and recruitable LWD as decommissioned roads re-vegetate and streambanks re-stabilize.

Stream Miles Improved

Miles of stream improved includes miles of restored habitat connectivity (described in the proceeding section), miles of RCA road decommissioning and road improvements (graveling) in RCAs. Stream miles improved with each of the proposed alternatives is displayed below (Table FH-17).

Table FH-17. RCA system road improvements and RCA system road decommissioning.

Subwatershed	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E	
	RCA road Improved	RCA Road Decom.	RCA road Improved	RCA Road Decom.	RCA road Improved	RCA Road Decom.	RCA road Improved	RCA Road Decom.	RCA road Improved	RCA Road Decom.
Boulder Creek	0	0	4.9	10.6	1.7	17.1	4.9	10.6	3.6	10.5
Upper Weiser River	0	0	7.3	10.1	6.7	13.7	8.3	9.7	7.6	4.5
Lost Creek	0	0	8.8	8.4	8.2	8.5	15.1	8.2	12.9	6.2
Upper West Fork Weiser River	0	0	11.8	2.7	8.8	8.0	14.6	2.7	14.8	1.3
Lower West Fork Weiser River	0	0	0.7	0.3	0.2	1.1	0.7	0.3	0.2	0
Totals	**0**	**0**	**33.5**	**31.9**	**25.6**	**48.3**	**43.6**	**31.6**	**39.1**	**22.5**

Table FH-18. Stream Miles Improved. Includes miles habitat connectivity (Table FH-15) and RCA system road improvements and RCA system road decommissioning from Table FH-17 (above).

Subwatershed	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Boulder Creek	0	30.8	44.2	30.8	29.4
Upper Weiser River	0	28.1	31.1	28.7	12.1
Lost Creek	0	40.8	40.3	46.9	19.1
Upper West Fork Weiser River	0	22.2	24.5	24.0	16.1
Lower West Fork Weiser River	0	1.0	1.3	1.0	0.2
TOTAL	**0**	**122.9**	**141.4**	**131.4**	**76.9**

Alternative A (no action) does not propose culvert replacements, road decommissioning or road improvements that would address the SWRA restoration objective of the project. No stream miles improved would be realized with this project.

Alternative B (proposed action)would result in approximately 123.9 stream miles improved from the 31.9 miles of road decommissioning in RCAs (Table FH-17), 57.3 miles of habitat connectivity (Table FH-15) and 33.5 miles of RCA road improvement to reduce road-related sediment production in in RCAs. Within Boulder Creek, Alternative B would result in 30.8 stream miles improved.

Alternative C would result in 141.4 stream miles improved within the project area, which is the most of the action alternatives. This alternative includes 48.3 miles of road decommissioning in RCAs, 67.0 miles of fish habitat connectivity and 25.6 miles of RCA road improvement. 44.2 miles of stream improved within the Boulder Creek subwatershed would result from this alternative and is the greatest of the action alternatives.

Alternative D would result in 131.4 stream miles improved from the 31.6 miles of road decommissioning in RCAs (Table FH-17), 57.3 miles of increased fish habitat connectivity (Table FH-15) and 43.6 miles of RCA road improvement to reduce road-related sediment production in in RCAs. This alternative improves approximately7.5 miles more than the proposed action (Alternative B) because more roads were identified as haul routes and would receive graveling and improvements in RCAs.

Alternative E would result in the fewest stream miles improved of the action alternatives, mostly due to fewer miles of habitat connectivity restored and less RCA road decommissioning. This alternative would result in 76.9 stream miles improved due to the 22.5 miles of RCA road decommissioning, 15.3 miles of increased fish habitat connectivity and 39.1 miles of RCA road improvements.

Summary of SWRA Restoration Objectives

Alternative A (no action) does not meet the SWRA restoration objectives of the project. Effects of existing roads (fish passage barriers, accelerated sediment production, and impairment of RCAs and RCA processes) would be maintained at the current levels.

Alternative B (proposed action) addresses the SWRA restoration objectives with improvement of 40 fish passage barriers decommissioning of 158.9 miles of road decommissioning (including 31.9 miles of RCA road), and would result in 122.9 miles of stream improved. Within the Boulder creek subwatershed, restoration activities would move the watershed towards the desired conditions for Soil Water Riparian and Aquatic Resources and move the watershed from the WCF “Impaired” category to the “Functioning at Risk” category.

Alternative C moves the Boulder Creek subwatershed furthest toward the desired condition described in the Forest Plan and proposes watershed restoration actions (primarily road decommissioning) that move the remaining subwatershed further towards the desired condition (when compared to the other action alternatives). Alternative C address the SWRA restoration objective with improvement of the 40 identified fish passage barriers (with additional stream crossing removal in the Boulder Creek subwatershed associated with road decommissioning) 248.9 miles of road decommissioning (including 48.3 miles of RCA roads) and improves a total of 141.4 miles of stream. This alternative would result in the most restoration benefit to SWRA resources and meets the SWRA restoration objectives of the project by improving the Boulder Creek watershed to the “Functioning at Risk” category, but further towards the

"Functioning Appropriately" category than the other action alternatives. Alternative C moves all other subwatersheds in the project area furthest toward the desired conditions in the Forest Plan.

Alternative D address the SWRA restoration objectives with improvement of 40 fish passage barriers decommissioning of 158.9 miles of road decommissioning (including 31.6 miles of RCA road), and would result in 131.4 miles of stream improvement. Within the Boulder creek subwatershed, restoration activities would move the watershed towards the desired conditions for Soil Water Riparian and Aquatic Resources and move the watershed from the WCF "Impaired" category to the "Functioning at Risk" category.

Alternative E would move the Boulder Creek subwatershed to the WCF "Functioning at Risk" category from the "Impaired" category, but improvements to other subwatersheds in the project area would be less than the other action alternatives. Outside of Boulder Creek, this alternative does not address any proposed fish passage improvements and decommissions fewer roads than the other action alternatives.

3.5.4 Direct and Indirect Effects

Issues

- Watershed condition and sediment rates may be altered due to the proposed activities for roads, vegetative treatments and prescribed fire within the analysis area.
- Mechanical vegetation treatments and prescribed fire in RCAs may negatively affect sediment delivery, stream temperatures and LWD.
- Indicators
- Maximum percent over natural sediment yield (BOISED model output).
- Acres of RCA vegetation treatments and prescribed fire.
- Acres of vegetation treatment within one site-potential tree height.

Sediment

Removal of vegetation, mechanical disturbance, and topographic alteration increase the erodibility of forest soils and, consequently, both the amount of soil available for transport and the likelihood of transport downslope and into streams. Once in streams, fine sediment (most frequently regarded as particles smaller than 6.3 mm in diameter) may be transported further downstream or deposited in slow water areas and behind obstructions, locally altering fish habitat conditions. In particular, fine sediment has been shown to fill the interstitial spaces among larger streambed particles, which can eliminate the living space for various microorganisms, aquatic macroinvertebrates, and juvenile fish. Potential problems associated with excessive sediment have long been recognized in a variety of salmonid species and at all life stages, from possible suffocation and entrapment of incubating embryos (see e.g., Coble, 1961; Phillips et al., 1975; Hausle and Coble, 1976; McCuddin, 1977; Cederholm and Salo, 1979; Peterson and Metcalfe, 1981; Irving and Bjornn, 1984; Tagart, 1984; Reiser and White, 1988), through loss of summer rearing and overwintering cover for juveniles (see e.g., Bjornn et al., 1977; Kelley and Dettman, 1980; Hillman et al., 1987; Griffith and Smith 1993), to reduced availability of invertebrate food for resident adults (see e.g., Tebo, 1955; Nuttall, 1972; Cederholm and Lestelle, 1974; Bjornn et al., 1977; Alexander and Hansen, 1986).

The Geomorphic Roads Analysis and Inventory Package (GRAIP) will be implemented in the Boulder Creek subwatershed to further identify specific road related erosion issues. Field inventories were conducted in 2013 (at the time this document was prepared). Treatments associated with GRAIP are

expected to result in additional site-specific sediment improvements on roads in the Boulder Creek subwatershed.

Alternative A

BOISED Sediment Model

Boulder Creek, Upper Weiser River, Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River subwatersheds. In this Alternative, current management activities, including the existing transportation system would remain in place and continue to have effects to sediment production within the project area. Actions proposed in this project to improve current sediment conditions (such as road decommissioning, road maintenance and graveling) would not occur. The current sediment condition and trend would be maintained with this alternative and the results of the action alternatives will be compared to these baseline conditions. In the Boulder Creek subwatershed, the BOISED sediment model predicts long-term annual sediment production to remain at 4.5 percent over natural (current condition).

Alternative B

BOISED Sediment Model

Boulder Creek subwatershed. Sediment yield and BOISED modeling is discussed in detail in section 3.2 of this document and in the Watershed Specialist Report. The BOISED model predicts a maximum sediment yield of 14.0 percent over natural with Alternative B the Boulder Creek subwatershed, which is a 9.5 percent over natural increase compared to the no action alternative (Figure WS-3). In the short- to long-term timeframes, the BOISED model predicts a reduction of annual sediment production to 3.4 percent over natural, which is a reduction over the no-action alternative. The increase in sediment production as well as the short- to long-term decrease is expected to be immeasurable in fish habitat because the changes in sediment production are relatively low. Sediment increases that result in an observable change in streambed conditions are generally detrimental to fisheries (Potyondy et al, 1991), and Potyondy et al. (1991) identified threshold of 100 percent over natural for allowable change in management related sediment yield on the Boise National Forest. The predicted short term maximum sediment yield associated with this alternative is well under that threshold (14.0 percent over natural). Likewise, the short- to long-term decrease in sediment production is expected to result in negligible improvements to fish habitat, and would not result in a functional change in the Boulder Creek subwatershed.

Upper Weiser River, Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River subwatersheds. The results of BOISED sediment modeling were not yet available at the time this document was published. Ground disturbing activities and prescribed fire are expected to cause a temporary- to short-term increase in sediment production, followed by a short- to long-term reduction (over the no-action alternative) in sediment production (primarily associated with road decommissioning). The long-term reduction in sediment production is expected to incrementally improve sediment conditions all subwatersheds, but no changes to the sediment functional ratings are expected.

Acres of RCA Vegetation Treatments

Boulder Creek subwatershed. RCA vegetation treatments are not proposed in the Boulder Creek subwatershed. RCA buffers of 120 feet and 240 feet would be applied to all perennial and intermittent channels respectively. RCA buffers have been shown to be effective in protecting streams from non-channelized sediment flow (Belt et al. 1992) and will be implemented in this alternative. RCA buffers,

however, may not entirely protect stream courses from channelized and road related sediment input. Prescribed fire entering RCAs also has the potential to decrease the filtering capacity of understory vegetation and organic material (described below). Implementation of RCA buffers in addition to PDFs, mitigation measures, and use of BMPs are expected to minimize sediment input to streams to immeasurable levels.

Upper Weiser River, Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River subwatersheds. Acres of RCA vegetation treatments proposed in each of the aforementioned subwatersheds are displayed in Table FH-19. Vegetation treatments in RCAs would not occur within 120 feet of perennial streams and not within 60 feet of intermittent streams. 1,814 acres of RCA treatments are proposed in the project area, which is approximately 17.6 percent of the total RCA acres in those subwatersheds. This includes 254 acres of vegetation treatments proposed within 1 site potential tree height of intermittent streams, (which is 2.4 percent of the total RCA acres). The small area of treatment within 1 site potential tree height (Table FH-20), the no-activity buffers within the RCAs, project design features, mitigation measures and BMPs applied to RCA treatments are not expected to measurably affect sediment conditions in fish habitat or at the subwatershed scale.

Table FH-19. Acres of RCA vegetation treatments proposed in each alternative. RCA treatments are not proposed in Boulder Creek (GIS Data rounded to the nearest acre).

Subwatershed	Total RCA Acres (Forest Service ownership)	Proposed Acres of RCA Vegetation Treatment				
		Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Upper Weiser River	2118	0	416	0	422	417
Lost Creek	4,497	0	667	0	734	662
Upper West Fork Weiser River	2,394	0	579	0	621	496
Lower West Fork Weiser River	1,257	0	152	0	214	77
Total	**10,266**	**0**	**1,814**	**0**	**1,990**	**1,652**

Table FH-20. Ares of RCA vegetation treatments proposed within 1 site potential tree height (120 feet) of intermittent stream channels. RCA treatments are not proposed in Boulder Creek (GIS Data rounded to the nearest tenth acre).

Subwatershed	Total RCA Acres (Forest Service ownership)	Proposed Acres of RCA Vegetation treatment within 1 site potential tree height				
		Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Upper Weiser River	2118	0	16	0	16	16
Lost Creek	4,497	0	111	0	119	103
Upper West Fork Weiser River	2,394	0	124	0	133	116
Lower West Fork Weiser River	1,257	0	3	0	3	0
Total	**10,266**	**0**	**254**	**0**	**271**	**235**

Table FH-21. Acres of proposed prescribed fire included in identified burn blocks in each subwatershed

Subwatershed	Alternatives B, C, and D		Alternative E	
	Acres within Burn Blocks	RCA Acres within Burn Blocks	Acres within Burn Blocks	RCA Acres within Burn Blocks
Boulder Creek	3,179	574	0	0
Upper Weiser River	7,759	1,613	1,869	370
Lost Creek	12,088	1,464	10,674	1,300
Upper West Fork Weiser River	9,713	1,564	9,109	1,505

Subwatershed	Alternatives B, C, and D		Alternative E	
	Acres within Burn Blocks	RCA Acres within Burn Blocks	Acres within Burn Blocks	RCA Acres within Burn Blocks
Lower West Fork Weiser River	1,396	554	1,396	554
Total	**34,135**	**5,769**	**23,048**	**3,729**

* Includes total acres of RCA located within identified burn blocks. Ignition of prescribed fire would not occur within RCAs in the Boulder Creek subwatershed. Elsewhere in the Project Area, approximately 25 percent of the RCAs within burn blocks may receive some ignition of prescribed fire and ladder fuel treatments in the outer portions of the RCA.

Prescribed Fire and Ladder Fuel Treatments

Boulder Creek, Upper Weiser River, Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River subwatersheds. The effects of prescribed fire on sediment production are incorporated into the BOISED sediment model for the Boulder Creek subwatershed. Across the Project Area, all ladder fuel treatments in RCAs would be conducted entirely by hand crews, and would create little if any ground disturbance, which would not result in increased sediment production. In the Boulder Creek subwatershed, no ignition of prescribed fire or ladder fuel treatments would occur within RCAs. Prescribed fire would, however, be allowed to "back" into RCAs where appropriate vegetation exists. Outside of the Boulder Creek subwatershed, prescribed fire will be allowed to back into RCAs and some ignition will may occur there in appropriate vegetation types (but not within the Boulder Creek subwatershed). Ignition is expected to occur in the outer portion of up to 25 percent of RCAs located in burn blocks (personal communication D. Doane, Fuels Specialist) and prescribed fire ignitions would not occur within 120 feet of perennial streams and not within 60 feet of intermittent streams. All ignitions in RCAs would be subject to PDFs intended to improve or maintain riparian areas and their functions. Fire behavior in RCAs is expected to be of low intensity due to the seasonal timing of burning (spring or fall), higher relative humidities, wetter soil conditions, and project design features applied within RCAs. Low intensity prescribed fire is expected to burn in a mosaic, leaving organic material, ground cover and riparian vegetation, maintaining the sediment filtering capability of the RCAs (Author personal observation). Beche et al. (2005) found that sediment was not affected in watershed streams a year after prescribed fire (with ignition in RCAs) of low to moderate intensity. In a ponderosa pine forest, Arkle and Pilliod (2010) did not observe effects to sediment from prescribed fire that did not include RCA ignitions. Prescribed fire effects from this project are expected to be similar to those observed by Beche et al. and Arkle and Pilliod.

Road Decommissioning

Boulder Creek, Upper Weiser River, Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River subwatersheds. Alternative B proposes approximately 158.9 miles of road decommissioning across the project area. Road decommissioning proposed in each Project Area subwatershed (including decommissioning in RCAs) is displayed in Table WS-11. Road decommissioning proposed (including reductions in RCA roads) in Alternative B is expected to result in short-term increases in sediment with long-term reductions (improvement) to the sediment conditions in all subwatersheds in the Project Area. Fine sediment in fish habitat related to road density (Nelson et al. 2004), and one consequence of the project will be to reduce the overall road density within the project area.

Alternative C

BOISED Sediment Model

Boulder Creek subwatershed. In the Boulder Creek subwatershed, the BOISED model predicts a maximum sediment yield of 8.9 percent over natural which is 4.4 percent over natural greater than no action alternative. In the short-to long-term timeframes, the BOISED model predicts a reduction of annual sediment production to 2.6 percent over natural, which is a reduction over the no-action alternative and would provide the greatest benefit to sediment production of the action alternatives. The predicted increase in sediment production as well as the short- to long-term decrease is expected to be immeasurable in fish habitat because the changes in sediment production are relatively low. The short- to long-term decrease in sediment production is expected to result in negligible improvements to fish habitat, and would not result in a functional change in the Boulder Creek subwatershed.

Upper Weiser River, Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River subwatersheds. The results of BOISED sediment modeling were not yet available at the time this document was published. The results of sediment modeling are predicted to be similar to those described above, with ground disturbing activities and prescribed fire resulting in a temporary- to short-term increase in sediment production, followed by a long-term reduction in sediment production (associated with road decommissioning). The long-term reduction in sediment production associated with this alternative is expected to provide the greatest long-term benefit to sediment conditions because this alternative proposes the greatest amount of road decommissioning in all subwatersheds across the project area.

Acres of RCA Vegetation Treatments

Boulder Creek, Upper Weiser River, Lost Creek, Upper West Fork Weiser River, Lower West Fork Weiser River subwatersheds. Alternative C does not propose any RCA vegetation treatments in RCAs. RCA buffers of 120 feet and 240 feet would be applied to all perennial and intermittent channels respectively. RCA buffers have been shown to be effective in protecting streams from non-channelized sediment flow (Belt et al. 1992) and will be implemented in this alternative.

Prescribed Fire and Ladder Fuel Treatments

Boulder Creek, Upper Weiser River, Lost Creek, Upper West Fork Weiser River, Lower West Fork Weiser River subwatersheds. The effects of prescribed fire on sediment production will be incorporated into the BOISED sediment model. Proposed acres of prescribed fire and its associated effects with respect to sediment are identical to that discussed in Alternative B.

Road decommissioning.

Boulder Creek, Upper Weiser River, Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River subwatersheds. Alternative C proposes approximately 248.9 miles of road decommissioning across the project area, which is the most of all action alternatives. Road decommissioning proposed in each project area subwatershed (including decommissioning in RCAs) is displayed in Table WS-11. Road decommissioning proposed (including reductions in RCA roads) in Alternative C is expected to result in a short-term increase in sediment with the greatest long-term reduction (improvement) to the sediment condition in all subwatersheds in the project area.

Alternative D

BOISED Sediment model

Boulder Creek subwatershed. The results of the BOISED model predict a maximum sediment increase in the Boulder Creek subwatershed to 15 percent over natural, with a short- to long-term reduction to 3.4 percent over natural. Both the maximum increase and the short-to long-term decrease are expected to result in immeasurable changes in fish habitat, because both changes are relatively small (based on Potyondy et al. 1991). The short- to long-term decrease in sediment production is expected to incrementally improve in-stream fish habitat conditions, but not result in a functional change in the subwatershed.

Upper Weiser River, Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River subwatersheds. The results of BOISED sediment modeling were not yet available at the time this document was published. The temporary- to short-term increase in sediment production as well as the long-term reduction is expected to be similar to Alternative B based on the treatments and activities described in Chapter 2. The long-term reduction in sediment production is expected to incrementally improve sediment conditions all subwatersheds, but no changes to the sediment functional ratings are expected.

Acres of RCA Vegetation Treatments

Boulder Creek subwatershed. RCA vegetation treatments are not proposed in the Boulder Creek subwatershed. RCA buffers of 120 feet and 240 feet would be applied to all perennial and intermittent channels respectively. RCA buffers have been shown to be effective in protecting streams from non-channelized sediment flow (Belt et al. 1992) and will be implemented in this alternative.

Upper Weiser River, Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River subwatersheds. Acres of RCA vegetation treatments proposed in each of the aforementioned subwatersheds are displayed in Table FH-19. Proposed RCA vegetation treatments are similar to those proposed in alternative B, whereas treatments would not occur within 120 feet of perennial streams and not within 60 feet of intermittent streams. 1,990 acres of RCA treatments are proposed in the project area (excluding the Boulder Creek subwatershed) which is approximately 19.4 percent of the total RCA acres in those subwatersheds. This alternative proposes 173 additional acres of RCA treatment when compared to Alternative B. Of those, 271 acres of vegetation treatments are proposed within one site potential tree height of intermittent streams, (which is 2.6 percent of the total RCA acres and 17 acres more than proposed in Alternative B). RCA vegetation treatments are not expected to measurably affect sediment conditions as the subwatershed scale due to the small area treated within one site potential tree height, project design features, mitigation measures and BMPs that would be implemented

Prescribed Fire and Ladder Fuel Treatments

Boulder Creek, Upper Weiser River, Lost Creek, Upper West Fork Weiser River, Lower West Fork Weiser River subwatersheds. The effects of prescribed fire and associated ladder fuel treatments on sediment production are incorporated into the BOISED sediment model for the Boulder Creek subwatershed. Elsewhere, proposed acres of prescribed fire and its associated effects with respect to sediment are identical to that discussed in Alternative B.

Road decommissioning

Boulder Creek, Upper Weiser River, Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River subwatersheds. Road decommissioning proposed in Alternative D and the expected effects to sediment are identical to those described in Alternative B.

Alternative E

BOISED Sediment Model

Boulder Creek subwatershed. The BOISED model predicts a maximum increase in sediment production to 14.0 percent over natural, with a short- to long-term decrease to 3.5 percent over natural (which is 0.1 percent over natural greater than Alternatives B and D). Both the maximum increase and the short-to long-term decreases are expected to result in immeasurable changes in fish habitat, because both changes are relatively small (based on Potyondy et al. 1991). The short- to long-term decrease in sediment production is expected to incrementally improve in-stream fish habitat conditions, but not result in a functional change in the subwatershed.

Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River subwatersheds. The results of BOISED sediment modeling were not yet available at the time this document was published. This alternative includes a reduced amount of road decommissioning (when compared to the other action alternatives) and is expected to result in the least long-term reduction in sediment production of the action alternatives. This alternative is expected to provide the least long-term benefit to sediment conditions across the Project Area because this alternative proposes the least amount of road decommissioning. The long-term sediment reduction is expected to incrementally improve sediment conditions in all subwatersheds, but no changes to the sediment functional ratings are anticipated.

Acres of RCA Vegetation Treatment

Boulder Creek subwatershed. RCA vegetation treatments are not proposed in the Boulder Creek subwatershed. RCA buffers of 120 feet and 240 feet would be applied to all perennial and intermittent channels respectively. RCA buffers have been shown to be effective in protecting streams from non-channelized sediment flow (Belt et al. 1992) and will be implemented in this alternative.

Upper Weiser River, Lost Creek, Upper West Fork Weiser River, Lower West Fork Weiser River subwatersheds. Alternative E proposes RCA treatments on 1,652 acres, which is approximately 16.1 percent of the total RCA acres in these subwatersheds. Of those 1,652 acres 235 of vegetation treatment would occur within one site-potential tree height of intermittent channels (but not within 60 feet of stream channels), which is 2.3 percent of the total acres of RCA in those subwatersheds.

Prescribed Fire

Boulder Creek subwatershed. Alternative E does not propose any prescribed fire within the Boulder Creek subwatershed, and would therefore, not affect sediment conditions in that portion of the project area.

Upper Weiser River, Lost Creek, Upper West Fork Weiser River, Lower West Fork Weiser River subwatersheds. Alternative E would treat approximately 30 percent fewer acres than the other action alternatives. The effects of prescribed fire on sediment production are incorporated into the BOISED sediment model. Prescribed fire will be allowed to back into RCAs and some ignition will may occur there in appropriate vegetation types (outside the Boulder Creek subwatershed). Sediment conditions are

expected to be maintained by this alternative because the sediment filtering capabilities of RCAs are expected to be maintained due to expected lower fire intensities as described above in Alternative B.

Sediment Summary

All of the action alternatives are predicted to result in a temporary to short-term increase in sediment with short- and -long term improvement towards the desired conditions. Alternative C is expected to result in the greatest long-term benefit to sediment production in all subwatersheds across the project area primarily due to proposed road decommissioning.

RCA vegetation treatments are not proposed in the Boulder Creek subwatershed, but are proposed in some RCAs elsewhere in the project area. Proposed RCA treatments would include approximately 15-19 percent of the total RCA acres (subwatersheds excluding Boulder Creek) depending on the Alternative. Treatments proposed within one site-potential tree height comprise approximately 2-3 percent of the total acres of RCA. Where RCA treatments are not proposed stream buffers of 240 feet and 120 feet on perennial and intermittent streams respectively would be applied. The Boulder Creek subwatershed is an ACS priority for restoration and contains ESA Listed fish species and their respective DCH. Temporary increases in sediment production are expected (from road decommissioning and culvert activities) followed by a short to long-term reduction in sediment production associated with road decommissioning. The currently functional level of the Sediment/Turbidity WCI is "Functioning at Risk (FR)" in the Boulder Creek subwatershed, which is expected to be maintained in the short and long-term timeframe with anticipated incremental improvements in sediment production related to road decommissioning. Temporary increases in sediment associated with fish passage improvements are expected in bull trout and steelhead DCH. Scaife and Hoefer 2010 analyzed the effects of culvert replacements on listed species and DCH and made the determination that culvert removals and replacements are a "May affect, likely to adversely affect" action. Temporary adverse effects to listed species and their respective DCH are outweighed by improvements (in all three timeframes) in fish habitat connectivity.

Stream Temperature

Project activities that would remove or alter vegetation that provides shading to streams have the potential to increase insolation and in turn increase stream temperatures. Stream temperatures are maintained by stream shading and as shade increases, water temperature decreases (Murphy and Meehan, 1991). Vegetation treatments (including free thin, free thin biomass and pre-commercial thinning) proposed within RCAs have the potential to reduce stream shading which may affect project area stream temperatures. RCA treatments are described in Appendix A of the Lost Creek-Boulder Creek DEIS. RCA treatments are not proposed in the Boulder Creek subwatershed. Elsewhere in the project area, no RCA treatments would occur within one site-potential tree height (120 feet) of perennial streams. RCA treatments proposed within one site-potential tree height (in this case 120 feet) of stream channels would only occur on intermittent streams, with no activities occurring within 60 feet of the stream channels. Acres of proposed RCA treatments are described in Tables FH-19 and FH-20 for each of the subwatersheds in the Project Area.

Alternative A

Actions proposed with this project would not occur under this alternative. Vegetation treatments, prescribed fire, fish passage improvements, road activities (road use, re-routes and relocation, decommissioning and culvert installations) and recreation improvements would not affect vegetation providing stream shading and would therefore not alter stream temperatures. Proposed road

decommissioning in RCAs would also not occur, maintaining road-related effects to stream temperature currently occurring. This alternative would be expected to maintain the current temperature conditions in all subwatersheds in the analysis area and not retard the attainment of an appropriately functioning temperature condition.

Alternative B

Acres of RCA Vegetation Treatments

Boulder Creek subwatershed. RCA vegetation treatments are not proposed in the Boulder Creek subwatershed and would therefore, maintain stream shading and stream temperatures at their current condition which is "Functioning at Risk" (FR). All vegetation treatments would implement stream buffers of 240 feet and 120 feet on perennial and intermittent streams respectively (including unmapped streams and other water sources discovered during implementation).

Upper Weiser River, Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River subwatersheds. There are approximately 10,266 acres of RCA within the aforementioned subwatersheds. Alternative B proposes 1,814 acres of RCA vegetation treatments (that include free thin, free-thin biomass and pre-commercial thinning) in those areas (combined) (Table FH-19), which is approximately 19 percent of the total acres of RCA. All RCA treatments would occur according to the description of RCA treatments in Chapter 2 of the Lost Creek-Boulder Creek FEIS. Of the 1,814 acres of RCA proposed to receive vegetation treatments, 254 acres would occur within one site-potential tree height (within 120 feet of intermittent stream channels). This is approximately 2.4 percent of the total RCA acres. All RCA vegetation treatments are not expected to increase stream temperatures from the current conditions at the subwatershed scale because no RCA treatments would occur within 120 feet of perennial channels and only limited harvest would occur in the outer 120 feet (of the 240 feet RCA). Brazier and Brown (1973) determined that an 80 feet buffer strip provided maximum shading on small coastal streams and Steinblums (1977) concluded that an 85 feet buffer strip provided stream shade similar to that of an undisturbed canopy. FEMAT (1993) evaluates the effectiveness of buffers with respect to tree height, and demonstrates that a buffer width of one tree height retains most of the shading and LWD functions. Vegetation treatments within one site-potential tree height (120 feet) would only occur on intermittent streams and no treatment would occur within 60 feet of the intermittent channels. RCA treatments within one site potential tree height are not expected to have any measurable effects to stream temperatures at the subwatershed scale. DeWalle (2010) found buffer widths of 18-20m (which is approximately 59.1-65.6 feet) provided approximately 85-90 percent of total shade to streams. In this project, harvest would not occur within 60 feet of intermittent channels and limited harvest would occur from 60-120 feet of intermittent channels, which is expected to maintain adequate stream shading. In addition, the acreage treated within one site-potential tree height would be small relative to the overall amount of RCAs (approximately2.4 percent) and intermittent streams are expected to be dry during the hottest (summer) months when increases in water temperatures from reductions in shading would most likely occur.

Prescribed Fire

Boulder Creek subwatershed. Alternative B proposes approximately 3,179 acres of prescribed fire in the Boulder Creek subwatershed, which includes Priority 1 and Priority 2 areas (described in Chapter 2 of the FEIS). Ignition of prescribed fire within RCAs is not proposed in the Boulder Creek subwatershed. Direct ignition in RCAs would not occur, but fire would be allowed to "back" into RCAs from upland areas, which has the potential to alter stream shading by changing the structure of both overstory and understory

vegetation. Prescribed burning in the Boulder Creek subwatershed is not, however, expected to increase the current temperature condition and would not retard the attainment of a properly functioning condition. Stream shading will be maintained because no direct ignition will occur in RCAs, and if fire does enter RCAs, the seasonal timing of burning (either in the spring or fall), and anticipated lower fire intensities in RCAs due to higher relative humidity and soil moisture, is not expected to alter stream shading to the extent which water temperatures will be affected.

Upper Weiser River, Lost Creek, Upper West Fork Weiser River and Lower West Fork Weiser River subwatersheds. Alternative B proposes 30,956 acres of prescribed fire in the aforementioned subwatersheds. Fire would be allowed to "back" into RCAs from upland areas and some ignition may occur there where appropriate vegetative conditions exist (with approval from the hydrologist(s) and fish biologist(s)) and WCIs would be maintained. No ignition would occur within 120 feet of perennial channels or 60 feet of intermittent channels. Fire in RCAs either from direct ignition or fire that is allowed to "back" into RCAs does have the potential to alter stream shading by changing the structure of both overstory and understory vegetation. Prescribed burning, including active ignition in RCAs, is not expected to result in any measurable changes to stream temperatures in the Project Area. Prescriptions would require low intensity fire in RCAs and would not target reductions in overstory. Understory thinning may also be conducted, which would reduce ladder fuels with the intent of keeping fire from entering the overstory, which would also maintain stream shade. Although a small amount of overstory may be directly or indirectly killed by fire, overstory mortality in RCAs is not expected to be substantial. The seasonal timing of burning (spring or fall), and anticipated lower fire intensities in RCAs due to higher relative humidity and soil moisture, is not expected to alter stream shading to the extent which water temperatures will be affected. It is expected that much of the riparian vegetation would either not burn or burn at a low intensity, resulting in a mosaic of low intensity and unburned areas. Halfosky and Hibbs (2009) found that in riparian areas in Oregon, vegetation within riparian areas rapidly regenerated following wildland fires. Similar observations have been made on the Payette NF (personal observation, primary author). On spring burns where fires was allowed to back into riparian areas, vegetation quickly re-grew within the growing season, resulting in little evidence that fire was in the area (personal observation, primary author).

Alternative C

Acres of RCA Vegetation Treatments

Boulder Creek, Upper Weiser River, Lost Creek, Upper West Fork Weiser River and Lower West Fork Weiser River subwatersheds. RCA vegetation treatments are not proposed in any part of the Project Area in Alternative C and would therefore not affect shading or stream temperatures.

Prescribed Fire

Boulder Creek subwatershed. Prescribed fire treatments proposed in Alternative C are identical to that described for Alternative B (above). Ignition of prescribed fire within RCAs is not proposed in the Boulder Creek subwatershed, but fire would be allowed to "back" into RCAs from upland areas. Effects to stream temperatures from prescribed fire are expected to be the same as those discussed in Alternative B (above).

Upper Weiser River, Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River subwatersheds. The 30,956 acres of prescribed burning are proposed outside of the Boulder Creek subwatershed, is identical to that proposed in Alternative B. Fire would be allowed to "back" into RCAs from upland areas and some ignition may occur there where appropriate vegetative conditions exist (with

approval from the hydrologist(s) and fish biologist(s)) and WCIs would be maintained. No ignition would occur within 120 feet of perennial channels or 60 feet of intermittent channels. Effects are expected to be identical to those described in Alternative B. Prescribed burning associated with Alternative C, including active ignition in RCAs, is not expected to result in any measurable changes to stream temperatures in the Project Area.

Alternative D

Acres of RCA vegetation treatments

Boulder Creek subwatershed. Alternative D does not propose any RCA vegetation treatments in Boulder Creek subwatershed. Default buffers of 240 feet and 120 feet on perennial and intermittent streams respectively are expected to maintain stream shading and stream temperatures.

Upper Weiser River, Lost Creek, Upper West Fork Weiser River and Lower West Fork Weiser River subwatersheds. Of the (approximately) 10,460 acres of RCA within the aforementioned subwatersheds, Alternative D proposes 1,958 acres of RCA vegetation treatments in those areas (combined) (Table FH-19). This is approximately 18.7 percent of the total acres of RCA. All RCA treatments would occur according to the description of RCA treatments in Chapter 2 of the Lost Creek-Boulder Creek FEIS. 267 acres of those proposed would occur within one site potential tree height (within 120 feet of intermittent stream channels). This is approximately 2.5 percent of the total acres of RCA. RCA vegetation treatments and their associated effects to stream shading are the same as discussed above in Alternative B.

Prescribed Fire

Boulder Creek subwatershed

Prescribed fire treatments proposed in Alternative D are identical to that described for Alternative B (above). Ignition of prescribed fire within RCAs is not proposed in the Boulder Creek subwatershed, but fire would be allowed to “back” into RCAs from upland areas. Effects to stream temperatures from prescribed fire are expected to be the same as those discussed in Alternative B (above).

Upper Weiser River, Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River subwatersheds. Prescribed fire treatments proposed in Alternative D are identical to that described for Alternative B above. Fire would be allowed to “back” into RCAs from upland areas and some ignition may occur there where appropriate vegetative conditions exist (with approval from the hydrologist(s) and fish biologist(s)) and WCIs would be maintained. No ignition would occur within 120 feet of perennial channels or 60 feet of intermittent channels. Prescribed burning associated with Alternative D, including active ignition in RCAs, is not expected to result in any measurable changes to stream temperatures in the Project Area.

Alternative E

Acres of RCA Vegetation treatments

Boulder Creek subwatershed. Alternative E does not propose any RCA vegetation treatments in Boulder Creek subwatershed. Default buffers of 240 feet and 120 feet on perennial and intermittent streams respectively are expected to maintain stream shading and stream temperatures.

Upper Weiser River, Lost Creek, Upper West Fork Weiser River, Lower West Fork Weiser River subwatersheds. There are approximately 10,266 acres of RCA within the aforementioned subwatersheds.

Alternative E proposes 1,652 acres of RCA vegetation treatments in those areas (combined) (Table FH-19), which is approximately 16.1 percent of the total acres of RCA. All RCA treatments would occur according to the description of RCA treatments in Chapter 2 of the Lost Creek-Boulder Creek FEIS. Of the 1,652 acres of RCA proposed to receive vegetation treatments, 235 acres would occur within 1 site potential tree height (within 120 feet of intermittent stream channels). This is approximately 2.3 percent of the total acres of RCA. RCA vegetation treatments and their associated effects to stream shading are expected to be the same in Alternative E as discussed in Alternative B.

Prescribed Fire

Boulder Creek subwatershed. Alternative E does not propose prescribed fire within the Boulder Creek subwatershed and therefore would not affect stream shading or temperatures.

Upper Weiser River, Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River subwatersheds. Prescribed fire treatments proposed in Alternative E are described in Chapter 2 of the DEIS. This alternative proposes approximately 30 percent fewer acres of prescribed fire treatments across the project area when compared to the Proposed Action (Alternative B). Proposed prescribed fire activities are expected to maintain stream shading in areas treated as described in Alternative B.

Temperature Summary

All of the action alternatives are not expected to degrade current stream temperatures at the subwatershed scale and would not retard the attainment of a properly functioning temperature conditions. Where RCA treatments are proposed (subwatersheds excluding Boulder Creek in Alternatives B, D, and E) thinning treatments would not occur within 120 feet of perennial streams or within 60 feet of intermittent stream, which are expected to maintain stream shading based on literature reviewed (Steinblums 1977, Brazier and Brown 1973, FEMAT 1993 and DeWalle 2010). RCA treatments also represent a low percentage of the total RCA acres in the project area (and in each subwatershed) (Table FH-19). Low intensity prescribed fire in RCAs is expected to produce a mosaic of low intensity fire effects and not expected to reduce the canopy and shade providing vegetation to the extent that stream temperatures would be affected. Rapid regeneration of burned riparian areas is also expected (Halfosky and Hibbs 2009). Actions associated with roads, including culvert activities and road reconstruction in RCAs is expected to incrementally reduce stream shading but no measureable effects to stream temperatures are expected. Road decommissioning is expected to result in an incremental improvement to stream shading in the short and long term timeframes as vegetation becomes re-established on streambanks and in RCAs. Recreation improvements proposed in all of the action alternatives are also expected to maintain the current temperature conditions.

Within Boulder Creek which is an ACS priority for restoration and contains ESA Listed fish species and their respective DCH, stream temperature are expected to be maintained in the temporary and short term across the subwatershed with an incremental increase in stream shading in the short-and long term as roads are decommissioned. The current functional level of “Functioning at Risk (FR),” would be maintained in all three timeframes. Long-term incremental improvements in stream shading are not expected to result in any measurable changes to stream temperatures in streams that contain listed species or are DCH.

Large Woody Debris

Pool frequency and pool formation are highly correlated to larege woody debris (LWD) (Quigley and Arbelbide 1997). Pools provide thermal refuge, protective cover, resting habitat and provide spawning areas (generally in pool tails). Large woody debris creates habitat complexity and influences channel

development. Vegetation treatments (including free thin, free thin biomass and pre-commercial thinning) proposed within RCAs, and other project activities that may alter RCA vegetation (such as road activities, culvert removals or replacements and recreation improvements) have the potential to reduce existing and recruitable LWD. RCA treatments are described in Appendix A of the Lost Creek-Boulder Creek DEIS. Within the Boulder Creek subwatershed, no RCA vegetation treatments are proposed in any of the action alternatives. Elsewhere in the project area (Upper Weiser, Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River subwatersheds), RCA treatments (as described in Appendix A and Chapter 2 of the FEIS) may occur in RCAs where upland vegetation is present in the outer portion of the RCA, but would not occur within one site-potential tree height (120 feet) of perennial streams or in riparian vegetation. RCA treatments proposed within 1 site potential tree height (in this case 120 feet) of stream channels would only occur on intermittent streams, with no activities occurring within 60 feet of the stream channels or in riparian vegetation. Acres of proposed RCA treatments (by alternative) are described in Tables FH-19 and FH-20 for each of the subwatersheds in the Project Area.

Alternative A

Actions proposed in this project would not occur in this alternative. This alternative would maintain the current LWD conditions in all subwatersheds in the analysis area and would not retard the attainment of an appropriately functioning LWD condition. Existing effects to LWD such as dispersed recreation, unauthorized fuel wood collection and RCA road density would be expected to continue throughout the project area.

Alternative B

Acres of RCA Vegetation Treatments

Boulder Creek subwatershed. Vegetation treatments (including free thin, free thin-biomass and pre-commercial thinning) are not proposed anywhere in this subwatershed. Vegetation treatments would use stream buffers of 240 feet and 120 feet on perennial and intermittent streams respectively. Buffers would also be applied to all unmapped streams and other water sources discovered during implementation. Large woody debris conditions would not be influenced with this alternative.

Upper Weiser River, Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River subwatersheds. Alternative B proposes approximately 1,814 acres of RCA vegetation treatments in the aforementioned subwatersheds (Table FH-19), with 254 of those acres occurring within one site potential tree height (120 feet) of intermittent stream channels. Proposed RCA treatments would comprise 17.7 percent of the total RCA acreage in those subwatersheds. RCA treatments would focus on removal of small trees, which (in the long term timeframe) would promote a larger tree component in RCAs. RCA treatments are expected to maintain the current LWD conditions because no treatment would occur within 120 feet of perennial streams and no treatment would occur within 60 feet of intermittent channels. McDade et al. (1991) found that most large woody debris originates in areas immediately adjacent to the stream channel, with over 70 percent of LWD pieces originating within 65.6 feet (20 meters) of the channel. Fleece (2002) and Naiman et al. (2002) also determined that approximately 80 percent of LWD comes from the first 60 feet from the stream, with the remaining coming from beyond 60 feet. Murphy and Koski (1989) and Fetherston et al. (1995) found that almost all LWD originates within 30 meters of the stream channel and FEMAT (1993) demonstrates that buffers of one tree height effectively maintain litter fall, root strength, and retain most of the shading and LWD functions. The prescribed no-activity buffers of one site potential tree height (120 feet) on perennial streams are expected to provide an effective buffer

from effects from RCA treatments, maintaining current and recruitable LWD there. The 60 foot no-activity buffers on intermittent streams and limited treatments in the outer 60 feet combined with the relatively few acres of treatment within one site-potential tree height (Table FH-20) are expected to maintain current and recruitable LWD on intermittent streams. No measureable effects are expected to LWD at the subwatershed scale are expected from RCA treatments.

Prescribed Fire

Boulder Creek subwatershed. This alternative proposes 3,179 acres of prescribed fire in the Boulder Creek subwatershed. No ignition of prescribed fire would occur in RCAs, however fire may be allowed to "back" into RCAs from upland areas. If fire enters RCAs, low intensities are expected due to the seasonal timing of burning (either in the spring or fall), and higher relative humidities and soil moisture content in the RCA. Low fire intensities are expected to result in little tree mortality, and if trees are killed, they would become more readily recruitable as LWD. Arkle and Piliod (2010) found no effect on LWD after prescribed fire in a ponderosa pine forest that did not directly ignite RCAs. Buffers widths (240 feet on perennial streams and 120 feet on intermittent streams) are expected to maintain current and recruitable LWD.

Upper Weiser River, Lost creek, Upper West Fork Weiser River and Lower West Fork Weiser River subwatersheds. Approximately 30,952 acres of prescribed fire are proposed in the aforementioned subwatersheds. Fire would be allowed to "back" into RCAs from upland areas and some ignition may occur there where appropriate vegetative conditions exist (with approval from the hydrologist(s) and fish biologist(s)) and WCIs would be maintained. No ignition would occur within 120 feet of perennial channels or 60 feet of intermittent channels. Fire in RCAs does have the potential to reduce current and recruitable LWD by consuming current and recruitable (dead) standing trees. LWD (existing and recruitable) levels are not expected to be altered due to project design features requiring low intensity fire in RCAs, the seasonal timing of burning (spring or fall), and anticipated lower fire intensities in RCAs due to higher relative humidity and soil moisture. If any overstory mortality did occur as a result of prescribed fire, those trees would be more readily available for recruitment into the stream channel as they naturally fall. Beche et al. (2005) determined that there was no effect on LWD recruitment after al low to moderate prescribed fire that included active ignitions in RCAs. Arkle and Piliod (2010) found no effect on LWD after prescribed fire in a ponderosa pine forest that did not directly ignite RCAs. Current and recruitable LWD is expected to be maintained by buffer widths (240 feet on perennial streams and 120 feet on intermittent streams) in areas where RCA ignitions are not proposed.

Alternative C

Acres of RCA Vegetation Treatments

Boulder Creek, Upper Weiser River, Lost creek, Upper West Fork Weiser River and Lower West Fork Weiser River subwatersheds. RCA vegetation treatments are not proposed in any part of the Project Area in Alternative C and would therefore not affect current or recruitable LWD based on the conclusions in the literature described above (McDade et al. 1991, Fleece 2002, Naiman et al. 2002, Murphy and Koski 1989, Fetherston et al. 1995 and FEMAT 1993)

Prescribed Fire

Boulder Creek subwatershed. Prescribed fire treatments proposed in Alternative C are identical to that described for Alternative B (above). (Table FH-21). Ignition of prescribed fire within RCAs in not proposed, but fire would be allowed to "back" into RCAs from upland areas. Effects to LWD from

prescribed fire are expected to be the same as those discussed in Alternative B. Buffers widths (240 feet on perennial streams and 120 feet on intermittent streams) are expected to maintain current and recruitable LWD.

Upper Weiser River, Lost creek, Upper West Fork Weiser River and Lower West Fork Weiser River subwatersheds. Prescribed fire treatments proposed in Alternative D are identical to that described for Alternative B (above). Fire would be allowed to "back" into RCAs from upland areas and some ignition may occur there where appropriate vegetative conditions exist (with approval from the hydrologist(s) and fish biologist(s)) and WCIs would be maintained. No ignition would occur within 120 feet of perennial channels or 60 feet of intermittent channels. The effects are expected to be similar to Alternative B and not result in any measureable change to LWD in the Project Area.

Alternative D

RCA Vegetation Treatments

Boulder Creek subwatershed. RCA vegetation treatments (including free thin, free thin-biomass and pre-commercial thinning) are not proposed anywhere in this subwatershed in Alternative D. Vegetation treatments would use stream buffers of 240 feet and 120 feet on all perennial and intermittent streams respectively.

Upper Weiser River, Lost creek, Upper West Fork Weiser River and Lower West Fork Weiser River subwatersheds. Alternative D proposes approximately 1,990 acres of RCA vegetation treatments in the aforementioned subwatershed, which 176 acres more than Alternative B (Table FH-19). This is approximately 19.4 percent of the total RCA acres in those subwatersheds. 270 acres are proposed to occur within 1 site potential tree height (120 feet) of intermittent streams. Effects to LWD are expected to be the same as discussed in Alternative B.

Prescribed Fire

Boulder Creek subwatershed. Prescribed fire treatments proposed in Alternative D are identical to that described for Alternative B (above). Ignition of prescribed fire within RCAs in not proposed, but fire would be allowed to "back" into RCAs from upland areas. Effects to LWD from prescribed fire are expected to be the same as those discussed in Alternative B. Buffers widths (240 feet on perennial streams and 120 feet on intermittent streams) are expected to maintain current and recruitable LWD.

Upper Weiser River, Lost creek, Upper West Fork Weiser River and Lower West Fork Weiser River subwatersheds. Prescribed fire treatments proposed in Alternative D are identical to that described for Alternative B (above). Fire would be allowed to "back" into RCAs from upland areas and some ignition may occur there where appropriate vegetative conditions exist (with approval from the hydrologist(s) and fish biologist(s)) and WCIs would be maintained. No ignition would occur within 120 feet of perennial channels or 60 feet of intermittent channels. Effects are expected to be similar to Alternative B and not result in any measureable change to LWD in the Project Area.

Alternative E

Acres of RCA Vegetation Treatments

Boulder Creek subwatershed. Vegetation treatments in RCAs (are not proposed anywhere in this subwatershed in Alternative E. Vegetation treatments would use stream buffers of 240 feet and 120 feet on all perennial and intermittent streams respectively.

Upper Weiser River, Lost creek, Upper West Fork Weiser River and Lower West Fork Weiser River subwatersheds. Alternative E proposes approximately 1,652 acres of RCA vegetation treatments in the aforementioned subwatershed, which is 162 and 338 fewer acres than Alternatives B and D respectively (Table FH-19)(Alternative C does not include any RCA vegetation treatments). This is approximately 16.1 percent of the total RCA acres in those subwatersheds. 235 acres are proposed to occur within one site potential tree height (120 feet) of intermittent streams, Effects to LWD are expected to be similar to those discussed in Alternative B.

Prescribed Fire

Boulder Creek subwatershed. This alternative does not propose prescribed fire within the Boulder Creek subwatershed and therefore would not affect LWD.

Upper Weiser River, Lost creek, Upper West Fork Weiser River and Lower West Fork Weiser River subwatersheds. Approximately 20,000 acres of prescribed fire, are proposed in these subwatersheds, which is approximately 30 percent less than Alternative B (Table FH-21). Fire would be allowed to "back" into RCAs from upland areas and some ignition may occur there where appropriate vegetative conditions exist (with approval from the hydrologist(s) and fish biologist(s)) and WCIs would be maintained. No ignition would occur within 120 feet of perennial channels or 60 feet of intermittent channels. Although the acres proposed for treatment are less than those proposed in Alternative B, effects are expected to be similar and not result in any measureable change to LWD in the Project Area.

Large Woody Debris Summary

Removal of trees from RCAs has the potential to affect recruitable LWD. Forest Plan standard SWST10 states that "trees or snags that are felled within RCAs must be left in place unless determined not to be necessary for achieving soil, water riparian and aquatic desired conditions." All subwatersheds where RCA treatments are proposed are "Functioning Appropriately (FA)" with respect to LWD except for the Lower West Fork Weiser River, which is "Functioning as Risk (FR)." Design of RCA treatments are expected to maintain the current and recruitable LWD conditions. The action alternatives are expected maintain the current and recruitable LWD at the subwatershed scale and would not retard that attainment of properly functioning LWD conditions (all subwatersheds excluding Boulder Creek in Alternatives B, D, and E).

In the Boulder Creek subwatershed, which is an ACS priority for restoration and contains ESA Listed fish species and their respective DCH, LWD is expected to be maintained with project activities in the temporary and short-term. In the long term timeframe, an incremental increase in recruitable LWD is expected as trees become established on decommissioned roads. The currently functional level of "Functioning Appropriately (FA)" would be maintained in the long-term timeframe. No measureable effects to LWD in streams that contain listed fishes or are DCH are expected from proposed project activities.

Effects to Listed Species and DCH

The determination for all of the action alternatives is "May Affect, Likely to Adversely Affect" for Chinook salmon, Steelhead, bull trout and their respective DCH in the LSR subbasin (Boulder Creek subwatershed) portion of the project area. This determination is due to in-stream culvert work (installation, replacement, or removal) that could disrupt listed fishes at or downstream of the work sites through increased sediment and turbidity, as well as displacement and injury during handling and transport (including the risk of mortality) as fish are actively removed from work areas. Temporary sediment

delivery to DCH as well as disturbance of streambanks may also occur at and downstream of those sites. Temporary increases in sediment are also predicted, primarily as a result of road actions, including decommissioning, however, road decommissioning is expected to result in a short- and long-term decrease in sediment production, which will incrementally improve the sediment conditions in DCH for all three listed species. Culvert replacements and removals are also expected to benefit fish passage and DCH in the temporary-long term timeframes. In the Weiser River subbasin portion of the Lost Creek-Boulder Creek Landscape Restoration Project will have "No Effect" to Chinook salmon, steelhead, bull trout and their respective DCH because Anadromous species (Chinook salmon and steelhead) were extirpated by the Hells Canyon Dam Complex and bull trout are not present within or downstream of the project area.

Bull trout DCH includes 9 "Primary Constituent Elements" (PCEs) (75 FR 63898). A crosswalk was developed by Nelson (2011) that links the PCEs and the Forest Plan WCIs described in the baseline and effects matrices of the Payette NF Land and Resource Management Plan (USDA 2003a). Many of the matrix indicators are habitat components that make up the PCEs, but with specific values to facilitate interpretation of the baseline habitat conditions (Nelson 2011). Bull trout DCH will not be adversely modified or destroyed by this project because WCIs will be maintained or improved through all of the action alternatives. Adverse effects to listed fishes and DCH from culvert activities are analyzed in the Programmatic Stream Crossing BA (Scaife and Hoefer 2010). Sediment delivery to DCH from culvert removals and replacements are expected to be of short duration. Improved habitat connectivity, short-and long-term sediment reduction, as well as incremental improvements to RCAs, stream shading, and recruitable LWD are expected from proposed road decommissioning.

The determination for westslope cutthroat trout in the LSR subbasin is "Not Likely to Lead to Listing" (NLLL) because adverse effects are not expected to be measureable within the project area, any effects are expected to be fully discountable further downstream in the Little Salmon River where westslope cutthroat are found. In the Weiser River Subbasin, there will be "No Impact" to westslope cutthroat trout because it is outside of their historic range.

3.5.5 Cumulative Effects

A complete list of past, present, and reasonably foreseeable actions in the cumulative effects anlysis area can be referenced in Appendix C of the Lost Creek-Boulder Creek DEIS. The analysis area selected to analyze cumulative effects to fisheries resources consists of the following complete 6th level Hydrologic Units (HUs) that comprise the project area. The current USGS watershed boundary GIS layer was used to delineate subwatersheds (GIS 2010).

Past Actions

A combination of past management actions, including timber harvest, road building, roads in RCAs, livestock grazing, irrigation diversion and development and land management on private property have altered the condition of fish habitat and WCIs in the analysis area. Currently, man-made physical barriers and increased sediment production (primarily from roads) are likely affecting fish habitat within the analysis area. This analysis of cumulative effects does not attempt to quantify specific effects for each past action within the cumulative effects analysis area. The existing condition (environmental baseline) represents the impacts of past actions within the analysis area.

Cumulative Effects of this Project

Reasonably foreseeable actions in the analysis area include currently active vegetation management projects, prescribed fire, IDL and BLM timber sales, Forest System road maintenance, recreation use, motorized OHV use (ATVs and UTVs), unauthorized and authorized Forest roads, firewood cutting, livestock grazing on Forest and Private land, timber harvest on state and private land, housing development on private land, agriculture practices, noxious weed management and fire suppression.

Alternative A (no action) is expected to maintain the current trend of SWRA resources. Current roads would remain on the landscape and contour to affect WCIs such as sediment, LWD, stream shading, riparian areas and fish passage. Disturbance in RCAs is also expected to continue on non-Forest Service lands within the analysis area.

The cumulative effect of the action alternatives (Alternatives B, D, and E), when combined with reasonably foreseeable actions and the current conditions, are expected to either maintain or improve WCIs because of the reduction in sediment, RCA roads, and the road-related effects to fish habitat. The action alternatives (B, D, and E) remove man-made barriers to fish passage and decommission roads in RCAs. A temporary increase in sediment described in this analysis is not expected to be measurable in fish habitat and short and long-term sediment reduction would move conditions towards desired conditions. Alternative C would move the project area the furthest toward desired conditions and would provide the most incremental improvement in RCA function and processes. Roads that remain on the landscape (including authorized and unauthorized roads), especially those located in RCAs, would continue to affect WCIs (such as sediment, LWD, stream shading, and RCA function). The future trend of land management on non-Forest Service land is not known, but it is expected to be similar to the current conditions, which would continue to contribute to the cumulative condition.

3.5.6 Irreversible and Irretrievable Commitments

The Lost Creek-Boulder Creek Landscape Restoration Project is not expected to result in any irreversible or irretrievable commitments of habitat for MIS, ESA-Listed, or desired native fish species. ESA-Listed bull trout, steelhead and Chinook salmon are all found in the Boulder Creek subwatershed. The preliminary determination for all of the action alternatives is “May Affect, Likely to Adversely Affect” for the three listed species and their respective DCH.

3.5.7 Forest Plan Consistency

All of the proposed alternatives meet Forest Plan Standards and Guidelines and maintain or improve affected watersheds by maintaining or improving (either incrementally or measurably) WCIs toward the desired conditions identified in the Forest Plan. Forest Plan consistency is documented in an activity table located in the Project Record.

3.5.8 Project Record

This DEIS hereby incorporates by reference the Fisheries specialist report in the project record (40 CFR 1502.21). The report is located in the Fisheries section of the project record and contains the data, methodologies, analysis, maps, references, and technical documentation that the specialist relied upon to reach the conclusions in this DEIS.

3.6 Wildlife

Introduction

This section describes existing conditions of the wildlife resource in the project area and adjacent areas of concern (see Scope of the Analysis), and of the effects of four action alternatives on wildlife species and habitats, with respect to the above indicators and measurements.

Appendix A of the Forest Plan identifies desired conditions for tree size class, canopy closure class, species composition, snags, and coarse woody debris, using the historical range of variation (HRV) as the reference condition. Effects to these desired conditions are analyzed in the Forested Vegetation section of this DEIS. These same components are used to model changes in source habitat for wildlife species at a landscape scale. Project and site-specific data on patterns of habitat distribution and specific habitat features help inform the wildlife analysis.

The project area occurs in a landscape of forested habitats, ranging from low to high elevations. Proposed restoration treatments occur mostly in PVGs 2, 5, and 6, in the nonlethal and mixed1 fire regimes. These forested stands are interspersed with non-forested habitats, dominated by grasses, forbs, and shrubs (see Figure FV-1).

Change in habitat for wildlife species of concern was determined using habitat models designed for the draft Wildlife Conservation Strategy analysis. Vegetation data used in models was provided by the Lost Creek Boulder Creek Project silviculturist (see section 3.1, Forested Vegetation). Existing habitat modeling was verified by field review of a representative sample of forested stands in 2012 and 2013, coupled with documented wildlife species observations. The baseline data for this analysis were drawn from the following wildlife species records:

- Idaho Department of Fish and Game (IDFG) database, Idaho Fish and Wildlife Information System (IFWIS) (formerly known as the Conservation Data Center [CDC])
- Forest Service corporate database, Natural Resources Inventory System (NRIS) WILDLIFE
- New Meadows Ranger District wildlife observation records

Wildlife surveys have been conducted in different portions of the project area for many years, depending on the species. The project area contains no Forest Plan MIS transects for white headed or pileated woodpeckers but the area is part of the Collaborative Forest Landscape Restoration Area. The program on the PNF included monitoring to determine the effectiveness of the vegetation treatments at restoring and/or providing habitat for key wildlife species, specifically northern Idaho ground squirrel (NIDGS) and white-headed woodpeckers. Several monitoring transects have been established in the project area.

Proposed activities within the project area have the potential to affect habitat or habitat elements for species in Family 1 (Low Elevation, Old Forest), Family 2 (Broad Elevation, Old Forest), Family 3 (Forest Mosaic), Family 5 (Forest and Range Mosaic), and Family 12 (Grassland/Open Canopy Sage). Thirteen wildlife species were identified from these six habitat families as focal species to evaluate in this DEIS (Table WL-1) and are included in this section. Eleven other species of concern (i.e., Region 4 Sensitive species), not chosen as focal species were analyzed to the extent necessary to meet disclosure requirements,

based on their status, and also are included in this report. Other species and habitat families are not discussed in this analysis, because the alternatives would not manipulate habitat and/or cause disturbance to species associated with these families.

The effects analysis for the project includes wildlife species listed as Threatened or Candidate, by the Endangered Species Act (ESA) of 1973, as amended. Region 4 Sensitive Species and Forest Species of Special Interest were also included in the analyses (Table WL-1). Effects determinations for ESA-listed and Region 4 Sensitive species are summarized in Table WL-24 at the end of the effects analysis.

3.6.1 Scope of the Analysis

The analysis area in most cases is the project area. Effects to lynx are addressed based on lynx analysis units (LAUs). Due to the size of the project area, the same area was considered for the cumulative effects area.

3.6.2 Desired Condition, Forest Plan Direction, and Relation to the Wildlife Conservation Strategy

The desired condition for wildlife resources identified in the Forest Plan (USDA Forest Service 2003b) is that "the amount, distribution, and characteristics of vegetation are present at levels necessary to maintain viable populations of native and desired non-native species." This desired condition ties to the Desired Vegetation Conditions identified in Appendix A of the Forest Plan (USDA Forest Service 2003b), with a goal of supporting diverse wildlife habitats. A summary of these desired forest components is presented in Chapters 1 and 3 of the Forest Plan.

Forest-wide goals, objectives, standards, and guidelines for wildlife resources are found on pages III-8 through III-15 and III-25 through III-28 of the Forest Plan (USDA Forest Service 2003b). Forest Plan direction specifically applicable to the project for wildlife resources is listed below (USDA Forest Service 2003b):

- TEST03 –Design and implement projects to meet the terms of the Forest Service approved recover plans. If a recovery plan does not yet exist, use the best available information (for example BA's, BO's, letters of concurrence, Forest Service-approved portions of Conservation Strategies) until a recovery plan is written and approved
- TEST06 – Management actions shall be designed to avoid or minimize adverse effects to listed species and their habitats.
- TEST15 - Unless a broad-scale assessment has been completed that substantiates different historical levels of unsuitable habitat, limit disturbance within each LAU as follows: If more than 30 percent of lynx habitat within a LAU is currently in unsuitable condition, no additional habitat may be changed to unsuitable habitat as a result of vegetative management projects. Fire use, or fire hazard reduction and associated vegetation management activities within the wildland urban interface watersheds, that develop or maintain fuel profiles needed to reduce the risk of wildfire threats to the wildland urban interface areas, are NOT bound by this standard.
- TEST12—Vegetative management activities within lynx foraging habitat in LAUs shall not degrade, nor retard attainment of desired habitat for the lynx and its prey

- WIST02—Design and implement projects within occupied habitats of Sensitive wildlife species to help prevent them from becoming [federally] listed.
- WIST03—Mitigate management actions within known nesting or denning sites of MIS or Sensitive Species if those actions would disrupt the reproductive success of those sites during the nesting or denning period.
- WIST05—In goshawk territories with known active nest stands, identify alternate and replacement nest stands during project-level planning when it is determined that the proposed activity is likely to degrade nest stand habitat.
- WIGU01—Vegetation management should consider the following habitat conditions or features:
    - The amount, quality, and distribution of habitats,
    - Fragmentation within habitats,
    - Juxtaposition and connectivity to other habitats,
    - The influence of road-related degradation, and
    - Ecosystem processes that develop and modify habitat.
- WIGU05—Habitat should be determined for MIS or Sensitive wildlife species within or near the Project Area. Surveys to determine presence should be conducted for those species with suitable habitat.
- WIGU08 and WIGU13 address Rocky Mountain elk vulnerability to road-related mortality, and habitat security needs.
- WIGU07 – Use appropriate research to help define active, alternate and replacement nest stands for goshawks, and configuration of Post-Fledging Areas.
- WIGU09 - Even-aged regeneration cuts should be considered to provide big-game hiding cover when the vegetation conditions in the unit meet the definition of hiding cover in the Glossary.
- WIGU11 - Management actions should neither degrade nor retard attainment of winter range desired conditions except where outweighed by demonstrable short- or long-term benefits to winter range or where the Forest Service has limited authority.
- WIGU12 - Calving and fawning areas should be protected from project-related disturbance during big game calving or fawning. Calving/fawning areas and periods should be determined during site/project-level planning.
- WIGU14 - To address big game stress and exposure during critical wintering periods, thermal cover components on winter/spring ranges should be identified and managed during project planning and implementation. Management requirements or mitigation measures needed to maintain these components should be determined during site/project-level planning. As a general guideline, at least 15 percent thermal cover should be retained on big game winter ranges where this cover presently exists. Cover should be maintained in at least 30-acre patch sizes where available. Thermal and hiding cover may or may not occur on the same acres.

The Project Area is in Management Areas (MA) 3, 4, and 5. Pertinent wildlife management direction for these MAs includes the following objective and guideline (USDA Forest Service 2003b):

Management Area 3

- Goal 0331 - Restore northern Idaho ground squirrel habitat quality, abundance, and connectivity to promote recovery of the species
- Objective 0332 - Implement the recovery plan for the northern Idaho ground squirrel, when approved, to promote recovery of the species
- Objective 0333 - Improve enforcement of yearlong and seasonal road closures through signing and on-the-ground patrols to allow for improved big-game security.
- Objective 0334 - Coordinate with Idaho Department of Fish and Game to reduce bull elk vulnerability through the use of security areas and reductions in open road density to move toward State herd composition objectives.
- Objective 0335 - Maintain or restore the quality and abundance of forage in the Mountain Big Sagebrush and Bitterbrush vegetation groups to improve big-game winter/spring range habitat.
- Objective 0336 - Maintain or improve bald eagle nest sites at Lost Valley Reservoir to provide eagle nesting and roosting habitat and contribute to recovery of the species.
- Objective 0337 - Increase white-headed woodpecker habitat by managing ponderosa pine stands within the Ponderosa Pine/Xeric Douglas-fir, Warm Dry Douglas-fir/Moist Ponderosa Pine, and Dry Grand Fir vegetation groups toward the desired ranges of size classes, canopy closures, species composition, snags, and coarse woody debris, as described in Appendix A. The ranges of these components may vary by management prescription.
- Objective 0338 - Increase flammulated owl habitat by managing ponderosa pine stands within the Warm Dry Douglas-fir/Moist Ponderosa Pine and Dry Grand Fir vegetation groups toward the desired ranges of size classes, canopy closures, species composition, snags, and coarse woody debris, as described in Appendix A. The ranges of these components may vary by management prescription category.
- Standard 0339 - The northern Idaho ground squirrel will receive priority consideration for all management activities that occur within their known occupied habitat. The intent of this standard is not to exclude all other activities within this habitat, but rather to reduce or minimize potential impacts to this species while emphasizing habitat improvement within and adjacent to known sites.
- Standard 0340 - Vegetation treatments must be designed and implemented to maintain or improve existing wildlife habitat values in forest stringers south of Cuddy Mountain. Forest stringers in this area are defined as narrow fingers of forested vegetation less than 500 feet wide, or isolated patches of forested vegetation less than 10 acres in size.
- Guideline 0341 - An increase in the white-headed woodpecker or flammulated owl habitat may be achieved by the following methods:
    a) Reducing tree densities and ladder fuels under and around existing large ponderosa trees and snags to reduce the risk of tree-replacing fire and to restore more open canopy conditions.

b) Managing the firewood program to retain large-diameter ponderosa pine and large snags of other species through signing, public education, size restriction, area closures, or other appropriate methods.

Management Area 4

- Objective 0440 - Maintain or restore shrub communities for big-game winter/spring range in the lower Rapid River Watershed
- Objective 0441 - Increase white-headed woodpecker and flammulated owl habitat by managing ponderosa pine stands within the Warm Dry Douglas-fir/Moist Ponderosa Pine and Dry Grand Fir vegetation groups toward the desired ranges of size classes, canopy closures, species composition, snags, and coarse woody debris, as described in Appendix A.
- Guideline 4442 - An increase in the white-headed woodpecker or flammulated owl habitat may be achieved by the following methods:
    a) Reducing tree densities and ladder fuels under and around existing large ponderosa trees and snags to reduce the risk of tree-replacing fire and to restore more open canopy conditions.
    b) Managing the firewood program to retain large-diameter ponderosa pine and large snags of other species through signing, public education, size restriction, area closures, or other appropriate methods.

Management Area 5

- Goal 0526 - Restore northern Idaho ground squirrel habitat quality, abundance, and connectivity to promote recovery of the species.
- Objective 0527 - Implement the recovery plan for the northern Idaho ground squirrel, when approved, to promote recovery of the species.
- Objective 0528 - Increase white-headed woodpecker and flammulated owl habitat by managing ponderosa pine stands within the Warm Dry Douglas-fir/Moist Ponderosa Pine and Dry Grand Fir vegetation groups toward the desired ranges of size classes, canopy closures, species composition, snags, and coarse woody debris, as described in Appendix A. The ranges of these components may vary by management prescription.
- Standard 0529 - The northern Idaho ground squirrel will receive priority consideration for all management activities that occur within their known occupied habitat. The intent of this standard is not to exclude all other activities within this habitat, but rather to reduce or minimize potential impacts to this species while emphasizing habitat improvement within and adjacent to known sites.

Compliance with Forest Plan direction for wildlife management also is documented in the Project Record.

Wildlife Conservation Strategy

In 2006, the Forest began development of a more comprehensive Wildlife Conservation Strategy (WCS), to address the direction of Forest Plan guide WIOB03 that states “Prioritize wildlife habitats to be restored at a mid- or Forest-scale…. Initiate restoration activities on priority wildlife habitats to move current

conditions towards desired conditions." The draft WCS analysis draws on principles and scientific analysis methods generated as part of the Interior Columbia Basin Ecosystem Management Project (ICBEMP) (Raphael et al. 2000; Wisdom et al. 2000). The draft WCS compares source habitat conditions that existed prior to Euro-American settlement (HRV) (Morgan et al. 1994), and the level of change in those habitats, as noted in existing landscape conditions (Wisdom et al. 2000). This analysis was recently completed for the Forested Biological Community and revisions to the Forest Plan have been proposed in the Forest Plan Amendments Proposed to Facilitate Implementation of the 2011 Plan-Scale Wildlife Conservation Strategy Draft Environmental Impact Statement (draft WCS) (USDA Forest Service 2011b). The WCS includes several key terms, including source habitat, habitat family, and focal species. Definitions for terms used in this analysis can be found in the "Glossary" section of the DEIS. Until the proposed Forest Plan direction for the draft WCS is revised in a Record of Decision (ROD), the wildlife analysis for the Lost Creek-Boulder Creek project was completed using the best available science used in the WCS.

A key finding of the WCS was that wildlife species associated with low- to mid-elevation ponderosa pine forests had experienced the greatest loss of habitat, compared to historical conditions, and that these habitats should have the highest priority for restoration activities. These species and habitats are grouped into Habitat Family 1. A key focal species for Family 1 is the white-headed woodpecker, which also is a Region 4 Sensitive species (USDA Forest Service 2011a) and Forest Management Indicator Species (MIS).

In addition to Habitat Family 1, much of the project area includes Family 12 habitat (Grassland and Open canopy Sagebrush) which is represented by the federally listed focal species, northern Idaho ground squirrel.

Proposed modifications to existing Forest Plan direction can be found in Appendix 2 of the draft WCS. The following key changes to current management direction have been proposed in the draft WCS:

- Retain existing old-forest habitat and large tree forested stands.
- Restore habitat such that it promotes recruitment of old-forest habitat.
- Retain legacy ponderosa pine and western larch trees.
- Use a common set of conservation principles in project design (see below).
- Prioritize restoring habitats of greatest conservation concern (e.g., low- to mid-elevation pine forests) and their associated species.

Proposed revisions to Appendix E of the current Forest Plan provide additional direction on how to meet these changes, once approved. Although a ROD for the WCS is not expected until 2014, the Lost Creek-Boulder Creek Project analysis relied upon the best science available, including the draft WCS analysis, the concept of source habitat groupings into suites and habitat families, and the application of wildlife conservation principles.

Wildlife Conservation Principles

The six general conservation principles are as follows:

- Species well-distributed across their range are less susceptible to extinction than species confined to small portions of their range.
- Habitat in contiguous blocks is better than fragmented habitat.

- Large blocks of habitat containing large populations of species are superior to small blocks of habitat containing small populations.
- Blocks of habitat close together are better than blocks far apart.
- Interconnected blocks of fragmented habitat are better than isolated blocks, and dispersing individuals travel more readily through habitat resembling that preferred by the species in question.
- Blocks of habitat that are in areas where the direct, or indirect, effects of human disturbance are low are more likely to provide all elements of source environments for a given species than areas where effects of human disturbance are high.

Table WL-1. Wildlife Species Considered in the Analysis for the Lost Creek–Boulder Creek Landscape Restoration Project Draft Environmental Impact Statement.

Suite	Family Number and Name	Species Considered in this Analysis	Species Status[a]	Focal Species	Effects Disclosed in EIS &/or Wildlife Specialist Report (WSR)	Rationale for Disclosure in EIS
Forest Only	1-Low Elevation, Old Forest	White-headed Woodpecker	S/MIS	X	EIS/WSR	MIS and focal species for Habitat Family 1
	2-Broad Elevation, Old Forest	American Three-toed Woodpecker	S		WSR	Source habitat occurs mostly at elevations above project activities. Dependent mostly on disturbance Events such as fire. Source habitat not planned for treatment.
		Boreal Owl	S		WSR	Source habitat occurs mostly at elevations above project activities.
		Fisher	S		WSR	Source habitat occurs mostly at elevations above project activities.
		Flammulated Owl	S		EIS/WSR	Habitat may be affected by project activities.
		Great Gray Owl	S		EIS/WSR	Habitat may be affected by project activities.
		Northern Goshawk	S		EIS/WSR	Habitat may be affected by project activities. LRMP direction and PDFs ensure protections.
		Pileated Woodpecker	MIS	X	EIS/WSR	Source habitat occurs mostly at elevations above project activities.
	3-Forest Mosaic	Canada Lynx	T	X	EIS/WSR	Endangered Species Act listed - Threatened. No lynx seen in or near the Project Area. Habitat maintained, disturbance extremely unlikely. Full analysis in Biological Assessment.
		Mountain Quail	S		WSR	Potential habitat (i.e., riparian areas) likely not treated.
		Wolverine	P/S		WSR	Endangered Species Act listed -Proposed. Potential denning habitat (i.e., high elevation cirques and forests would not be treated. Full analysis in Biological Assessment.
Combination of Forest & Rangeland	5-Forest & Range Mosaic	Gray Wolf	S		WSR	Source habitat present; relies on appropriate prey species management (See elk discussion).
		Peregrine Falcon	S		WSR	No source habitat; no known or historical nesting sites in Project Area.
		Rocky Mountain Bighorn Sheep	S		WSR	Modeled summer range source habitat exists on northeast and southwest portions of project area outside of areas proposed for treatment.

Suite	Family Number and Name	Species Considered in this Analysis	Species Status[a]	Focal Species	Effects Disclosed in EIS &/or Wildlife Specialist Report (WSR)	Rationale for Disclosure in EIS
		Rocky Mountain Elk	SOSI		EIS/WSR	Payette National Forest Species of Special Interest and species of concern IDFG.
	7-Forests, Woodlands, & Sagebrush	Spotted Bat	S		WSR	No suitable roost sites within 6 mi.
		Townsend's Big-eared Bat	S		WSR	Limited source habitat.
Rangeland Only	11-Sagebrush	Greater Sage Grouse	SOLI		WSR	No source habitat in Project Area. No known populations on Payette NF.
	12-Grassland/ Open-Canopy Sage	Columbian Sharp-tailed Grouse	S		WSR	No source habitat in Project Area.
		Northern Idaho Ground Squirrel	T	X	EIS/WSR	ESA listed - Threatened. Occupied Source habitat in Project Area, ~1,190 acres; Approximately 309 individuals documented in Project Area in thirty-two locations (IDFG 2012).
Riverine & Non-riverine Riparian & Wetland	13-Riverine Riparian & Wetland	Bald Eagle	S	X	EIS/WSR	Riverine habitat present, observed. Occupied nest (multiple years) at Lost Valley Reservoir. Occupied also in 2013 (pers. obs.).
		Columbia Spotted Frog	S		WSR	Riparian & wetland buffers provide protection of source habitat where known to occur.
		Harlequin Duck	S		WSR	Source habitat not present, no observations.
		Yellow-billed Cuckoo	C/S		WSR	No source habitat.

[a]Species Status (USDI USFWS 2010): T = ESA Threatened; C = ESA Candidate; S = Region 4 Sensitive; MIS = Payette National Forest Management Indicator Species; SOSI = Payette National Forest Species of Special Interest; SOLI = Payette National Forest West Zone Species of Local Interest.

3.6.3 Affected Environment

Due to the reliance of many terrestrial wildlife species on old-forest habitat and snags, this section begins with a discussion of these important habitat components, followed by descriptions of current conditions of the modeled habitat for Family 1, as represented by the white-headed woodpecker; the modeled habitat for Family 2, as represented by the pileated woodpecker and flammulated owl; and modeled habitat for lynx and northern Idaho ground squirrel. Elk habitat quality and security are discussed in relation to the existing densities of authorized and unauthorized roads and the quantity and quality of treated and untreated habitats.

Old Forest

Old-forest habitat is an important source habitat condition that provides denning, nesting, foraging, and cover habitat for many wildlife species. As described in the Forest Plan and the draft WCS and as used in this analysis, old-forest habitat is distinguished by old trees in the large tree size class. Within stands, old-forest habitat is defined as species composition of the large tree class, number of snags per acre by size class, and tons per acre of coarse woody debris by size class; all in both single-story and multi-story conditions associated with fire regimes that were historically prevalent in central Idaho. The draft WCS provides a more detailed discussion of old-forest characteristics and management concerns. The draft WCS also provides background information for distinguishing between old forest and old growth (USDA Forest Service 2011b, Appendix E, pp. E-25 to E-28).

Old Growth Ponderosa Pine

Three large tree stands outlined in the draft WCS occur in the project area. The document referenced "Preserving and Restoring the Old Growth Ponderosa Pine Ecosystem in Idaho" by Mehl and Haufler 2004 These stands were field verified and determined to be deficient thirty trees per acre for ponderosa pine greater than 20" DBH. In addition, of the three stands in the project area, only one stand (Stand ID 0030580901) is not inside the Rapid River Inventoried Roadless Area (IRA) or a Riparian Conservation Area (RCA). After subtracting out the portion that is inside the IRA and RCA (Table WL-2), approximately 13.5 acres of this stand could be treated to promote the large tree ponderosa pine component.

Table WL-2. Stands selected from U.S. Forest Service data that are estimated to have a least 5 ponderosa pine per acre greater than or equal to 20 inches dbh in the Project Area (Mehl and Haufler 2004).

Stand ID	National Forest	Habitat Type	Trees/Acre > =20" DBH	Acres	Acres Treated by Proposal
0030480902	PNF	PVG 1	12	34	0
0030580901	PNF	PVG 2	10	80	13.5
0030700911	PNF	N/A	11	39	0

Vegetated sites in the project area not considered part of forested stands are typically scablands, dominated by bunchgrass, forb, and shrub species (Habitat Family 12), and would not contribute to any present or near-future, old-forest condition.

Snag Habitat

For many wildlife species, snags—particularly large-diameter snags—are an important habitat component. Snags are difficult to inventory because they occur in scattered, random clumps across the landscape. In general, snag numbers are higher when away from open roads and in dense stands where competition for resources makes trees less vigorous and less able to resist insect and disease damage and in areas where wildfires have occurred. The information presented here is based on recent Forest-wide inventories analyzed for the draft WCS (USDA Forest Service 2011b). Forest-wide, total snag numbers are within the HRV for PVGs 1, 2, and 5 but are above the high end of the HRV for all other PVGs (USDA Forest Service 2011b, p. 100, Table 3-18). Across the west side of the Forest, where the project area is located, snag numbers are generally within the HRV, but in some areas, snags are lacking due to the influence of roads or previous harvest activities. Snag numbers are often found to be below historical or desired amounts in roaded areas managed for timber products or in areas accessible to firewood cutters (Mannan et al. 1980; Zarnowitz and Manuwal 1985; Thomas 2002). Road densities are much higher on the west side of the Forest than the east side of the Forest, and while snag numbers are within the HRV on the west side, a notable difference in the numbers between the two areas exists (USDA Forest Service 2011b, pp. 98, 102). Of the seven PVGs with sufficient west side data, five (PVGs 4, 6, and 10) are within the HRV, and PVGs 7 and 8/9 are above the high end of the range for the number of snags per acre by diameter group. When PVGs that make up the nonlethal and mixed1 fire regimes are combined, all but medium snags in the mixed1 fire regime are within the HRV (Table WL-3).

In timber management areas, an emphasis on spacing to increase growth likely has resulted in unnatural snag distributions (i.e., isolated snags rather than clumps). Cavity nesting birds tend to select snags in clumps, rather than those uniformly spaced (Saab and Dudley 1998). Snags in managed areas have also been found to be more homogenous in size and decay class than would be expected under more natural conditions (Spiering and Knight 2005).

Despite these concerns, assuming that the west-side inventory data are applicable to the project area, the anticipated number of snags per acre at current condition is within, or above, the desired range in almost all snag size classes for all PVGs. PVGs 2 and 5 are the exceptions, which is not unexpected, because these forest types have been heavily managed in the past.

Table WL-3. Number of Snags per Acre by Diameter Group (DBH) and Potential Vegetation Group (PVG) and Relationship to the Historical Conditions for the Westside (Council, New Meadows and Weiser Ranger Districts) of the Payette National Forest.

Diameter Group	Westside									
	Nonlethal			Mixed1		Mixed2			Lethal	
	PVG 1	PVG 2	PVG 5	PVG 3	PVG 6	PVG 4	PVG 7	PVG 11	PVG 8/9	PVG 10
10.0–19.9 inches	--[a]	<1	7	--a	7	0	21	--[a]	24	8
≥20.0 inches	--[a]	1	0	--a	1	2	3	--[a]	4	N/A
Total	--[a]	2	7	--a	8	2	24	--[a]	28	8
Relationship to Historical Conditions										
10.0–19.9 inches	N/A	-1.3	+1.5	N/A	+1.5	-1.8	+15.5	N/A	+16.5	+0.3
≥20.0 inches	N/A	In	-0.4	N/A	In	In	In	N/A	+1.0	N/A
Total	N/A	-1.7	In	N/A	In	In	+15.0	N/A	+17.5	+0.3
Chi[b]	N/A	In	In	N/A	In	In	Out	N/A	Out	In

Habitat Family 1. Low-Elevation, Old Forest

Family 1 is proposed in the draft WCS (USDA Forest Service 2011b) as a habitat family of greatest conservation concern, due to widespread and substantial declines in habitat quantity on the Forest. This finding is consistent with assessments at other scales in Idaho and the Interior Columbia Basin (IDFG 2005; NPPC 2004; Ritter 2000; Wisdom et al. 2000).

Family 1 wildlife species depend on single-story, and, to a lesser extent, multi-story, lower-elevation, old forests as source habitats (Nutt et al. 2010). Family 1 source habitat occurs in large tree, low canopy cover conditions in PVGs 1, 2, 3, and 5, and in those habitat types of PVG 6 where ponderosa pine is a major seral component (USDA Forest Service 2011b). Special features of this source habitat are large-diameter live trees and snags (Wisdom et al. 2000). Historically, these types were maintained in a relatively open condition by frequent, nonlethal fire.

Fire exclusion and timber harvest have removed habitat and changed natural disturbance regimes, contributing to widespread, strong declines in Family 1 source habitat on the Forest and in the project area. Past timber harvest removed accessible, large-diameter ponderosa pine and, coupled with fire suppression, resulted in higher ladder fuel levels in the understory and greater proportions of climax tree species (e.g., grand fir), compared with historical conditions. Open, large-tree, ponderosa pine source habitats are less common than historically occurred in the project area. Past timber harvest activities also created a road network that persists today and facilitates removal of firewood from remnant standing and log habitat components in Family 1 habitat.

The project area includes three 5th field hydrologic unit watersheds (Middle Little Salmon River, West Fork Weiser River and Upper Weiser River) which are proposed in the draft WCS as Wildlife Family 1

priority habitat restoration areas because they include white-headed woodpecker observations or remnant patches of low-elevation, late-seral forest habitat, which is required by white-headed woodpeckers. The amount of source habitat for the white-headed woodpecker has greatly decreased from the HRV in these three watersheds. Modeled changes conducted for the WCS DEIS showed habitat for this species has decreased more than 60 percent from historical conditions in each watershed (USDA Forest Service 2011b) in the project area. This area also includes two ponderosa pine stands identified as priority restoration stands by the Ponderosa Pine Task Force (Mehl and Haufler 2004).

White-headed Woodpecker

The white-headed woodpecker is a Forest MIS, a Region 4 Sensitive species, and an Idaho Department of Fish and Game (IDFG) Species of Greatest Conservation Need. The white-headed woodpecker was selected as a focal species for Habitat Family 1 because it is believed to represent the key environmental correlates (KEC) and key ecological functions (KEF) of this family (USDA Forest Service 2011b).

KEFs for the white-headed woodpecker are as a primary consumer of ponderosa pine seeds and a secondary consumer of terrestrial invertebrates (Marcot 1997, O'Neil et al. 2001). White-headed woodpeckers forage on insects throughout the summer months. During the fall and early winter, conifer seeds supplement the insect diet. Large diameter, and typically older, ponderosa pine are important because they contain the cones, bark cracks, and crevices to support insects. Beginning in late summer, and through the winter, ponderosa pine seeds are the primary food source for the white-headed woodpecker, but seeds from other species may help provide a consistent food supply. White-headed woodpeckers also play an ecological role in excavating cavities and in seed dispersal (Garrett et al. 1996).

KECs for this species include forested habitats comprised of legacy trees, live trees, and snags >15 inches DBH (Marcot 1997, O'Neil et al. 2001). White-headed woodpeckers use the dead parts of live trees, as well as existing tree cavities, despite their status as primary excavators (O'Neil et al. 2001).

This species is closely tied to mature ponderosa pine forests with live and dead ponderosa pine trees >20 inches DBH in open canopy conditions (Blair and Servheen 1995, Dixon 1998, Frederick and Moore 1991). Although this species prefers open-canopy stands of mature and older ponderosa pine, it also uses mixed-species stands of ponderosa pine and Douglas-fir (Frederick and Moore 1991; Wisdom et al. 2000). Open-canopy conditions range from 20–26 percent (Blair and Servheen 1995) to 56 percent (Frederick and Moore 1991). A central Oregon study found a mean canopy closure of 24 percent at nest sites and 44 percent at roosts (Dixon 1995a), with most nest and roost trees in ponderosa pine forest types having <57 percent canopy closure (Dixon 1995b).

Source habitat for white-headed woodpeckers was defined in the draft WCS as forests in PVGs 1, 2, 3, 5, or 6, with large tree size class and low canopy closure class (USDA Forest Service 2011b). Approximately 731 acres of modeled white-headed woodpecker source habitat is currently identified in the project area (Table WL-4, Figure WL-1). Considering that the project area contains 64,578 acres of forested stands, with 25,286 of these acres in the large tree size class, the shortage of low canopy closure in these stands results in the lack of modeled source habitat for white-headed woodpeckers, which favor low to low-moderate density canopy conditions. In PVGs 2, 5, and 6, less than 13 percent of large tree, forested stands are currently in the low canopy closure class; this is far below the desired range of 74 percent–94 percent for PVG 2 and 25 percent–45 percent for PVG 5. PVG 6 large tree stands are within the desired range of 0 percent–20 percent low canopy closure.

Table WL-4. Current condition of White-headed Woodpecker source habitat (acres)

Tree Size/Canopy Cover Class	PVG-1	PVG-2	PVG-3	PVG-5	PVG-6	Totals
Large/Low	342	304	0	893	196	1,736

The area required to support white-headed woodpeckers in fragmented landscapes is larger than in landscapes with contiguous habitat (Dixon 1995a, b). Home range size in fragmented, mixed-conifer habitat was estimated at 845 acres, compared with 523 acres in contiguous ponderosa pine habitat (Dixon 1995a, b). Given the severely fragmented source habitat distribution in the project area (Table WL-4), the area likely supports 1-2 white-headed woodpecker home ranges. This home range estimate does not account for other specific white-headed woodpecker habitat requirements, such as the juxtaposition of nest trees to a stand of dense-canopy forest, or the effects of human activities (e.g., open roads, livestock grazing, logging activities, camping, and hunting) near nesting areas. Researchers in Oregon found that nest trees were often located within 90 feet of dense forest, although no specific tree density measurement was provided (J. Hollenbeck, USDA FS, pers. comm. 2010).

None of the six Wildlife Conservation Principles are met by current white-headed woodpecker source habitat conditions in the project area. Modeled white-headed woodpecker source habitat occurs in approximately 40 small patches (Figure WL-1). Although the white-headed woodpecker is capable of using fragmented habitat (Dixon 1995a,b), many of these habitat patches are more than 1.0 mile apart, and grouping "nearest-neighbor" habitat patches does not produce blocks of habitat even a fourth of a square mile in area.

Idaho Fish and Wildlife Information System (IFWIS), formally known as Conservation Data Center (CDC), records include approximately 8 white-headed woodpecker observations within 5.0 miles of, and one within, the project area for the period 1991–2008. Most observations (n = 7) were from Forest Service or State managed lands that surround the project area. In 2008 and 2009, the MIS transect survey technique was improved to include recorded white-headed woodpecker vocalizations and drumming along with repeat transect visits. In 2006, several observations of white-headed woodpeckers occurred at Price Valley, inside the project area, and adjacent on State or private land the east-central portion of the project area. In 2013, another observation was reported by IDFG in the same general area.

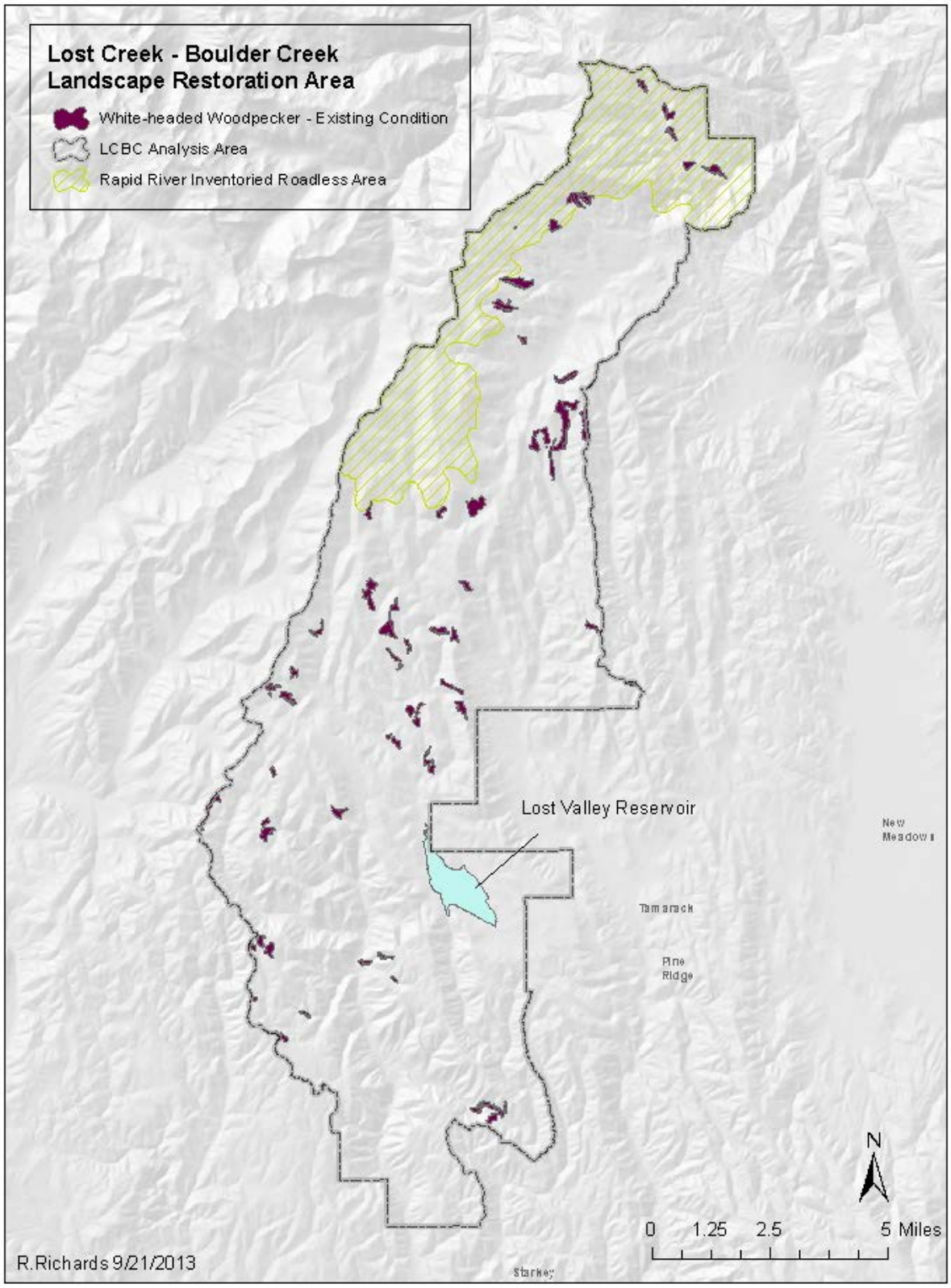


Figure WL-1. White-headed Woodpecker modeled source habitat, by Potential Vegetation Groups (PVGs) at Current Condition

Habitat Family 2. Broad-Elevation, Old-Forest

Species in Habitat Family 2 use late-seral, multi- and single-storied montane forests as source habitat (Wisdom et al. 2000). Habitat Family 2 source habitats overlap those of Habitat Family 1 but encompass a broader array of cover types and elevations. Special features of Habitat Family 2 source habitats are snags, often of larger diameter (>20 inches DBH), and logs. Some species that use these habitats depend on juxtaposition of certain seral stages, while others exhibit a negative response to older forest structural stages adjacent to younger structural stages. Many species are able to take advantage of departed vegetative conditions, benefitting as structural stages develop larger tree size classes and denser conditions. Even though Family 2 habitats, particularly large tree and old-forest, have substantially departed from the HRV, Family 2 wildlife species have been able to take advantage of departed source habitats historically used by Habitat Family 1 species.

Pileated Woodpecker

The pileated woodpecker was selected as a MIS because it is believed to be functionally linked to a suite of other wildlife species that use source habitats tied to large trees, snags and logs, and old-forest habitat in mixed-conifer forests that occur across broad elevations and developed under mixed fire regimes (Aubry and Raley 2003). The pileated woodpecker is not a Region 4 Sensitive Species (USDA Forest Service 2011a). This woodpecker is considered a resident, non-migratory, nongame species. Pileated woodpeckers occupy dense deciduous, coniferous, or mixed-species forests; open woodlands; second-growth forests; and parks and wooded residential areas (NatureServe 2008). The species prefers habitats with tall, closed canopies and high basal areas. Their preferred habitat includes large-diameter trees and snags; multiple canopy layers; decaying wood on the forest floor; and a somewhat moist environment that promotes fungal decay and ant, termite, and beetle foraging (NatureServe 2008).

Pileated woodpeckers perform KEFs as secondary consumers of terrestrial invertebrates (e.g., carpenter ants) and primary cavity excavators of snags and live trees. KECs for this species include snags and living trees >20 inches DBH, logs, hollow living trees, and dead portions of live trees (Bull et al. 1992). This species typically uses portions of dying trees and snags in the hard and moderate decay classes (early-to-mid stages of decomposition).

Source habitats for pileated woodpeckers are typically multi-layer, late-seral stage montane and subalpine forests in PVGs 2, 3, 5, 6, 8, and 9, with large tree size class and moderate-to-high canopy closure class. Approximately 20,412 acres of modeled pileated woodpecker source habitat currently occurs in the project area (Table WL-5, Figure WL-2). Table WL-5 shows these source habitats' distribution. Although the individual habitat patches are mostly less than 1.0 square mile in area, the connectivity of multiple polygons creates a mosaic of habitats that is widely distributed throughout the area with a variety of forest structure and patch size. Note the larger size, tighter distribution, and connectivity of habitat polygons for pileated woodpeckers (Figure WL-2), compared to that noted for white-headed woodpeckers in the project area.

Pileated woodpecker home ranges in northeastern Oregon (approximately 25–50 miles northwest of the project area) ranged from 316 to 593 acres (mean = 455 acres) (Bull and Meslow 1977). An average home range size of 1,006 acres was used in the Forest Plan Amendments Proposed to Facilitate Implementation of the 2009 Plan-Scale Wildlife Conservation Strategy, Phase 1: Forested Biological Community Environmental Impact Statement (USDA Forest Service 2011). The larger home range estimate was

attributed to lesser quality habitat. Using this larger home range estimate, the project area could support approximately twenty pileated woodpecker home ranges at current conditions. The FS Wildlife Database has five records of pileated woodpecker cavities in the project area. Although Forest Service records do not indicate observations of pileated woodpeckers, they are seen occasionally by forest users and wildlife staff.

Source habitat for pileated woodpeckers at current condition (Table WL-5) in the project area is inflated, because this species will readily use available habitat that is outside of HRV. In general, the white-headed woodpecker habitat that has been altered over the past hundred years is now used by pileated woodpeckers in addition to their required source habitats. While Forest-wide, long-term increases in pileated woodpecker source habitat are anticipated (USDA Forest Service 2011b), temporary and/or short-term negative impacts to habitat quality, or distribution, may occur when restoring forest conditions departed from the HRV to meet the habitat needs of wildlife species of greatest conservation need (e.g., white-headed woodpecker) and address the variety of other multiple-use management objectives in the Forest Plan.

Table WL-5. Current condition of pileated woodpecker source habitat (acres)

Tree Size/Canopy Cover Class	PVG-2	PVG-3	PVG-5	PVG-6	PVG-8	PVG-9	Totals
Large/Moderate	2,436	0	3,423	5,358	374	352	11,943
Large/High	713	0	2,622	4,751	162	221	8,128
Totals	3,149	0	6,045	10,109	536	573	20,412

Careful implementation of vegetation management should allow us to restore source habitat conditions for white-headed woodpeckers, while maintaining suitable habitat for pileated woodpeckers. Because the pileated woodpecker is a MIS, Forest managers should be able to assess habitat management tradeoffs between retaining departed landscapes to meet the short-term habitat needs of one species (pileated woodpecker) and restoring departed landscapes toward the HRV to address the short- and long-term habitat needs of another species (white-headed woodpecker).

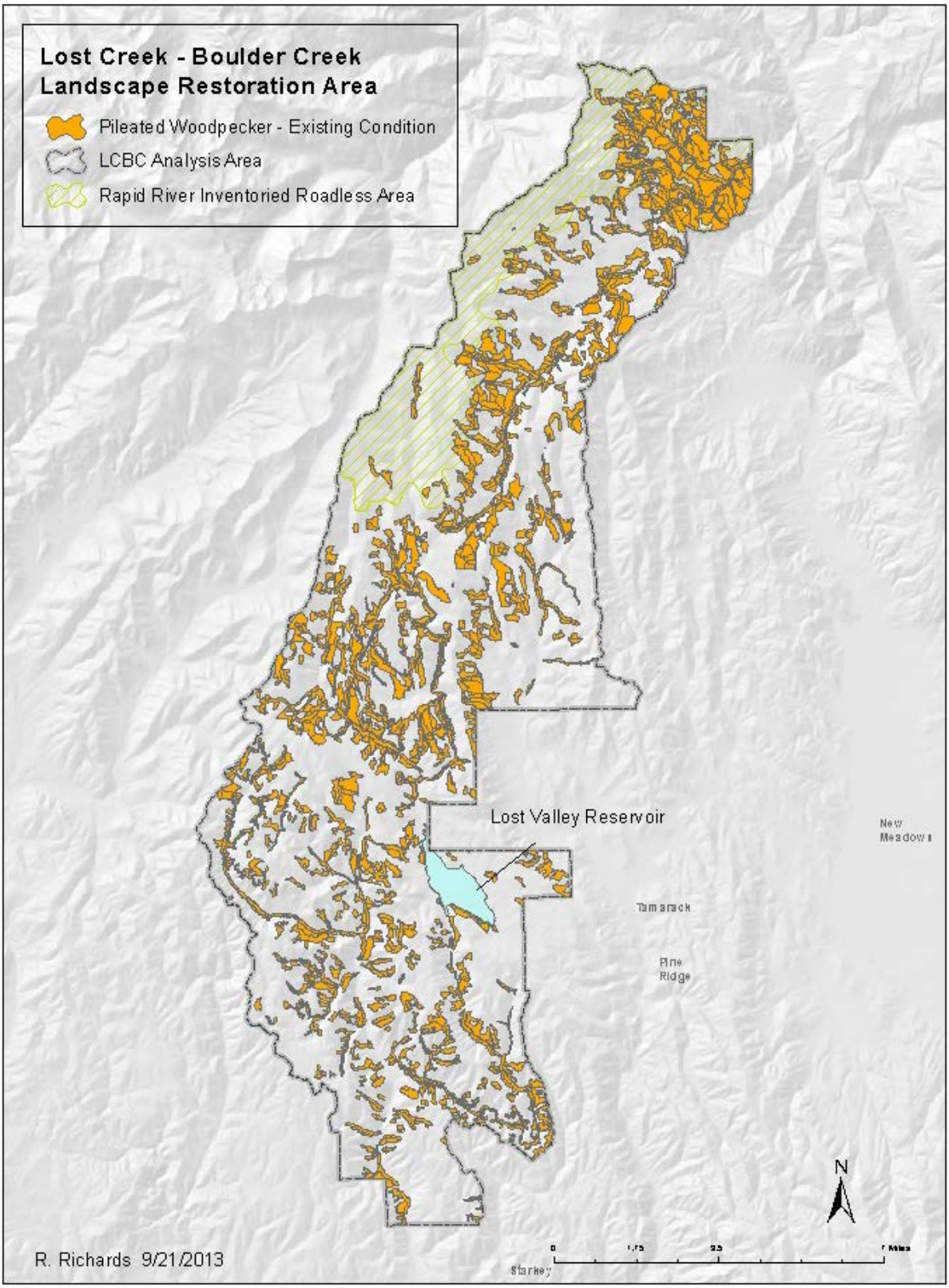


Figure WL-2. Pileated Woodpecker modeled source habitat, by Potential Vegetation Groups (PVGs) at current condition.

Flammulated Owl

The flammulated owl (FLOW) is a Forest Service Intermountain Region Sensitive Species and a State of Idaho Species of Greatest Concern. It was selected as a focal species for this analysis, because of its association with broad-elevation, old-forest habitats and because the effects of the action alternatives on this species would likely be greater than those associated with other wildlife species in Habitat Family 2, particularly the pileated woodpecker. FLOWs are considered a neo-tropical migrant, wintering in Central America. KEFs of the FLOW include being a secondary consumer of terrestrial invertebrates, as well as prey for secondary or tertiary consumers (Marcot 1997, O'Neil et al. 2001). KECs for this species include an association with forested habitats, comprised of live trees and snags, >10 inches DBH (Marcot 1997, O'Neil et al. 2001). Flammulated owls are secondary cavity nesters, occupying natural cavities and, more commonly, old woodpecker cavities (Marcot 1997, O'Neil et al. 2001, IDFG 2005, Barnes 2007).

Breeding habitat for the FLOW combines open, mature, montane pine forests for nesting; scattered thickets of saplings or shrubs for roosting and calling; and grassland edge habitat for foraging (Goggans 1986, Reynolds and Linkhart 1987, IDFG 2005). This bird requires these habitat components across multiple spatial scales (e.g., microhabitat, home range, and landscape) (Wright 1996). In Idaho, FLOWs have been documented in mid-elevation, old-forest habitat, and in mature stands of open ponderosa pine and/or Douglas-fir (Groves et al. 1997). Old forests of ponderosa pine and Douglas-fir are key habitat components for the FLOW (Reynolds and Linkhart 1992), as these forest types apparently support a particular abundance of favored Lepidoptera (moths and butterflies) prey (McCallum 1994). However, this owl will also use old forest with multi-layered canopies in aspen, cottonwood, and willow. Flammulated owls nest in cavities excavated by other bird species in snags and live, large-diameter trees (McCallum and Gehlback 1988, Bull et al. 1990). FLOW habitat is strongly associated with the upper slopes of ridges (Bull et al. 1990, Groves et al. 1997, Barnes 2007). These owls are obligate cavity nesters (IDFG 2005) and can take advantage of insect irruptions, as from spruce budworm (McCallum 1994, Marcot 1997, O'Neil et al. 2001).

Source habitat for FLOWs is found in PVGs 1, 2, 3, 5, and 6 (Figure WL-3). These habitats also overlap with several source habitats used by Habitat Family 1 wildlife species. These PVGs are most likely to have habitat types that develop late-seral stages of forest with stands dominated by ponderosa pine and/or Douglas-fir. Historical fire regimes in these PVGs include nonlethal, mixed1, and mixed2. FLOWs use the medium and large tree size classes and moderate canopy closure class. Unlike most species in Habitat Family 2, the flammulated owl does not use vegetative conditions departed from the HRV (USDA Forest Service 2011b). In general, source habitat for the FLOW is slightly below the HRV, both Forest-wide and on the west side of the Forest (USDA Forest Service 2011b). However, this estimate may be slightly inaccurate, because the habitat model cannot account for microsite conditions important to the species or the influence of roads on habitat quality.

Current conditions indicate approximately 23,237 acres of source habitat in the project area with the majority of the available habitat occurring in PVGs 2, 5, and 6 (Table WL-6). Using an average home range size of 31 acres (based on a range of 25 to 49 acres from Nutt et al. 2009), the project area could support approximately 750 FLOW home ranges. This number of home ranges is unlikely because the source habitat model cannot account for the availability, or juxtaposition, of required microsite components, such as snags with appropriate nest cavities, saplings and shrubs for roosting and calling, grassland edge habitat for foraging on moths and butterflies, and the owls' preference for using habitats on the upper portion of a given slope. For this reason, using the number of home ranges to infer some level of quality or quantity of

flammulated owl habitat, based only on identified source habitat by PVGs, is likely not appropriate for this analysis.

In Figure WL-3, note the larger size, tighter distribution, and connectivity of habitat polygons for flammulated owls, as compared to that noted for white-headed woodpeckers in Figure WL-1.

Table WL-6. Current condition of Flammulated Owl source habitat (acres).

Tree Size/Canopy Cover Class	PVG-1	PVG-2	PVG-3	PVG-5	PVG-6	Totals
Medium/Moderate	112	3,755	0	1,846	6,160	11,873
Large/Moderate	134	2,436	0	3,432	5,362	11,364
Totals	246	6,191	0	5,278	11,522	23,237

There are no historic flammulated owl observations recorded in the project area. However in 2013, Forest Service biologists set up three nocturnal playback surveys in the Butter Gulch and Price Valley areas. Although transects were completed late in the season for flammulated owls (mid-July), responses were documented at multiple calling stations along the established transects in modeled source habitat. These surveys focused on determining presence/absence of flammulated owls within the project area, particularly the proposed treatment areas.

A total of 14 owls were detected over 4 nights of calling on 4 different transects, consisting of 46 calling stations. Two of the transects, 26 calling stations, were in the Butter Gulch area and yielded 13 of the owl responses. On two occasions 2 owls responded at one calling station. The transect in the Lost Creek drainage, 6 calling stations, produced no responses and the one near Price Valley, 14 calling stations, netted one response. The Price Valley transect was not in modeled habitat, but there was a historical record of a flammulated owl nest in the area (USFS 2013).

In addition to this new data, the PNF partners with IDFG on flammulated owl surveys on other parts of the Forest. Of the 367 FLOW detections recorded Forest-wide during 1991–2011, 32 percent were beyond 300 ft. of currently modeled habitat. Many of these detections occurred in stands with smaller trees and lower and higher canopy cover than modeled (Evans Mack et al. 2012).

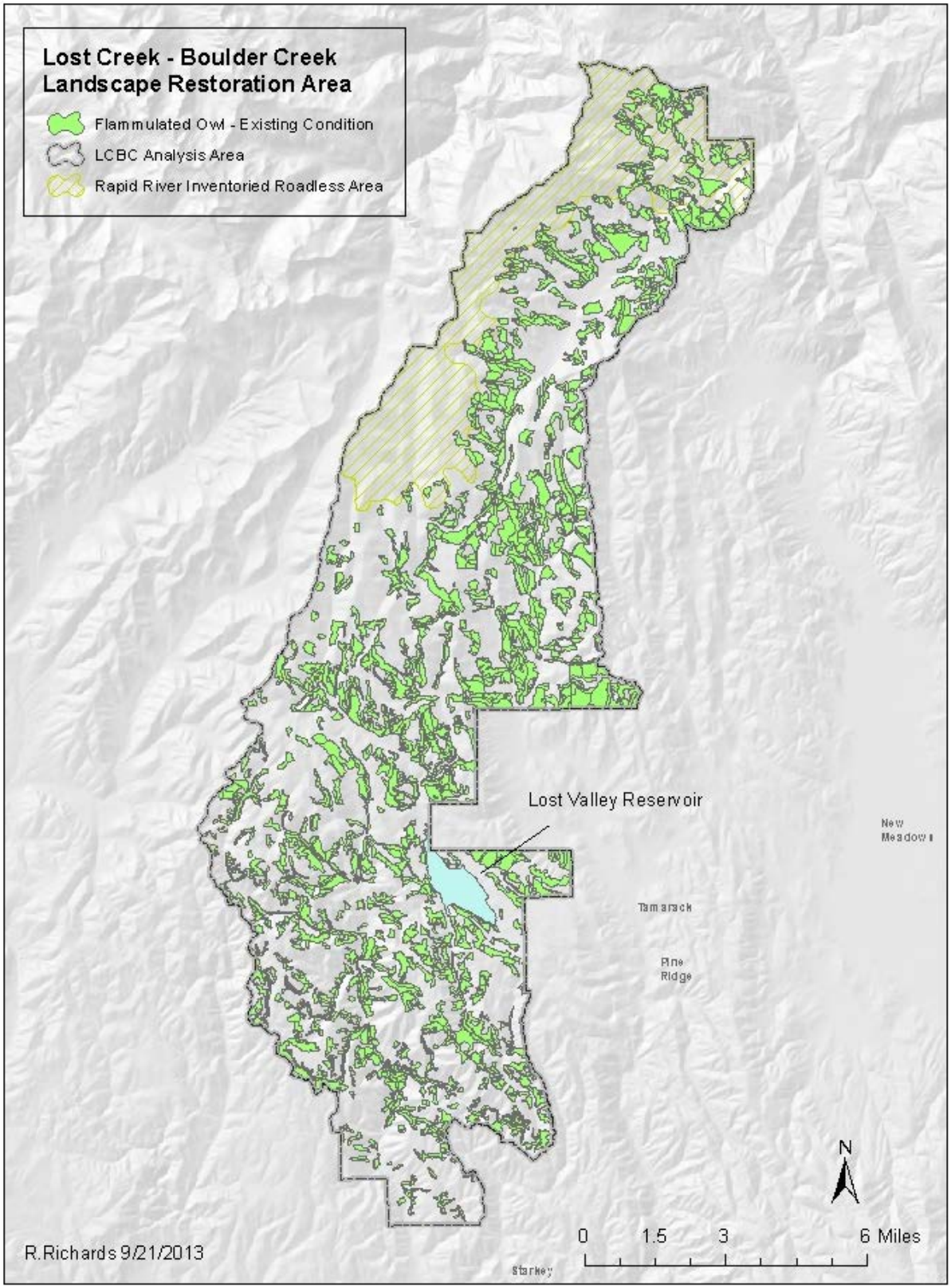


Figure WL-3. Flammulated owl modeled source habitat, by Potential Vegetation Groups (PVGs) at current condition

Great Gray Owl

The great gray owl is a Region 4 Sensitive Species. The Payette National Forest is on the southern periphery of the species' North American geographical distribution. Since 1964, 886+ records exist for this species on the Forest (FS Wildlife Sightings Database 2012, IFWIS 2012).

KEFs for great gray owl include its role as a secondary consumer of terrestrial vertebrates (Marcot 1997; O'Neil et al. 2001). The species depresses or controls prey species populations and uses aerial structures built by other species for nesting (Marcot 1997; O'Neil et al. 2001). KECs for the great gray owl include an association with forested habitats close to meadows, marshes, bogs, open forests, and herbaceous habitats (Duncan and Hayward 1994). Key forested features include remnant very large- to medium-sized trees and snags (15–30 in. DBH.) (Marcot 1997; O'Neil et al. 2001; Wisdom et al. 2000). Great gray owls rely on existing stick nests built by other large birds, natural platforms formed by dwarf mistletoe brooms, broken-topped snags, stumps, and supplemental boxes for nesting (Duncan and Hayward 1994; Marcot 1997; O'Neil et al. 2001). Live remnant legacy trees and hollow living trees are KECs for this species. Fire helps maintain meadows and open areas.

Great gray owl source habitat includes old forests (multi-and single-story); unmanaged, young, multi-story forests; and stand-initiation stages of subalpine and montane forests (Wisdom et al. 2000). The great gray owl is a contrast species associated with forested habitats in close proximity to meadows, marshes, bogs, open forests, and herbaceous habitats (Duncan and Hayward 1994). The habitat components considered most important are mature or older forest that provide suitable nesting sites; and suitable foraging areas that include non-stocked and seedling forests, meadows, and open riparian habitats that are adjacent to meadows. Large-diameter trees or snags are special habitat features for the species.

Juvenile great gray owls are flightless and depend on leaning and deformed trees to navigate from forest floors to tree canopies (Bull et al. 1988b; Franklin 1988). Dense cover near nests is important for fledgling protection. After leaving the nest, fledglings generally stay within forested stands with >60 percent canopy cover class (Bull et al. 1988b).

Vegetative communities capable of providing source habitat conditions include PVGs 3, 6, 7, 8, 9, and 11. Many of these PVGs historically had mixed2 and lethal fire regimes, which can create the juxtaposition of open and forested habitats used by the owls. Source habitat exists in most watersheds across the Forest. Approximately 290,000 acres of source habitat, without departed conditions, exist on the Forest, which is below the HRV. When departed habitat is included, the amount of source habitat exceeds the low end of the HRV. However, the modeled amount of historical and current source habitat is likely greatly overestimated, because the model could not account for forest stands proximity to open meadows, or other foraging habitats.

All six PVGs (3, 6, 7, 8, 9, and 11) that can provide source habitat for this owl are present in the project area. PVGs 3 and 11 only occur in modest amounts, fourteen and eight acres, respectively, but are not juxtaposed next to meadow habitat. Currently, 3,850 acres exhibit source habitat conditions (Table WL-7, Figure WL-4). Risk factors for this species include loss of potential nest sites, due to removal of large trees, diseased trees, snags, and leaning trees (used by juveniles); fire exclusion; loss of residual trees or snags in foraging habitat; high road densities; and rodent poisoning. Changes in patch dynamics also may have affected the size and juxtaposition of stands with large-diameter trees and high crown closures, which great

gray owls use for nest sites, relative to stands with variable seral stages and crown closures, which they use for foraging.

The average home range size is highly variable, ranging from 1,112 acres (Bull and Henjum 1990) to 16,630 acres, for first year dispersing birds. Adult birds in this study restricted home range movements to 1,483–5,436 acres. This larger range was used in the analysis.

Two sightings of this species were recorded in the project area in 2011 and 2013 (FS Wildlife Sightings Database 2013). Nest locations have not been identified but likely occur in either the Lost Valley, Price Valley or Bear Wallow areas where the observations occurred. Because great gray owls have been observed a project design feature (PDF) is included in Chapter 2. This PDF requires that nest surveys be completed in modeled habitat that is within 300 ft. of a meadow > ~7 acres. Where great gray owls are documented, protected activity centers (PAC's) will be established to maintain suitable nesting/fledging habitat characteristics. Additional surveys in probable nesting areas are planned each spring during project implementation and monitoring.

Table WL-7. Current condition of great gray owl source habitat (acres)

Tree Size/Canopy Cover Class	PVG-3	PVG-6	PVG-7	PVG-8	PVG-9	PVG-11	Totals
Medium/Low	0	0	766	12	12	0	790
Medium/Moderate	0	901	180	18	0	0	1,099
Medium/High	0	0	0	0	6	0	6
Large/Low	0	0	121	0	0	0	121
Large/Moderate	0	614	354	64	28	8	1,068
Large/High	0	550	185	28	3	0	766
Total	0	2,065	1,606	122	49	8	3,850

*Habitat is determined using the above PVG's within 300 ft. of a meadow greater than 7 acres.

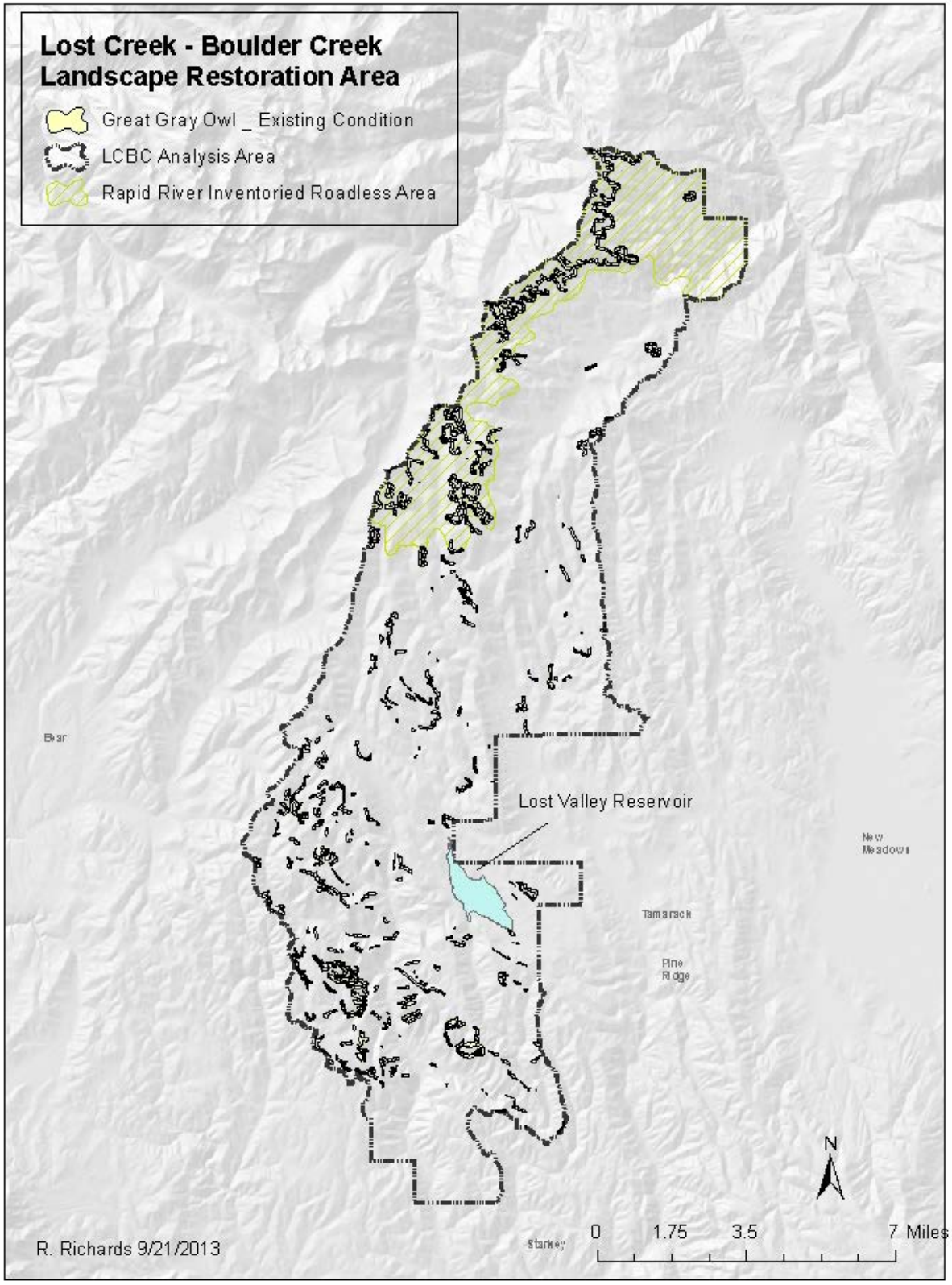


Figure WL-4. Great gray owl modeled source habitat, by Potential Vegetation Groups (PVGs) at current condition

Northern Goshawk

The northern goshawk is a Region 4 Sensitive Species. KEFs include the northern goshawks role as a secondary and tertiary consumer of terrestrial herbivores and predators (Marcot 1997; O'Neil et al. 2001). According to Kennedy (2003), northern goshawks are prey generalists. The species affects terrestrial vertebrate populations through predation and/or displacement and builds nests often used by other species (Marcot 1997; O'Neil et al. 2001). KECs (summer habitat) include an association with forested habitats and live trees and large snags, mistletoe brooms, legacy trees, coarse woody debris and edge habitat (Marcot 1997; O'Neil et al. 2001). A shrub layer is important for prey habitat (O'Neil et al. 2001). Deformities (i.e., multiple trunks and mistletoe [*Arceuthobium spp*.]), especially in smaller diameter trees, are also used as nest site substrates.

Goshawks use a variety of forest ages, structural conditions, and successional stages. Riparian zones and mosaics of forested and open areas are equally important (Griffith 1993), including shrubland and grassland habitats. Nest sites are typically located next to the trunk of large diameter trees and in older stands where trees are widely spaced (Hayward and Escano 1989). Northern goshawks prefer transitional zones for hunting. The home range for northern goshawks is estimated at more than 5,900 acres and includes three components: nesting, foraging, and post fledging family areas (Reynolds et al. 1992, Youtz et al. 2008).

Goshawk source habitat exists in most watersheds across the Forest. Approximately 240,000 acres of source habitat currently exist on the Forest—60,000 acres less than the HRV. When departed habitat acres are included, the amount of source habitat on the Forest increases substantially, to well within the HRV. Similar trends in northern goshawk source habitat are projected for the west side of the Forest. The predicted increase may not reflect any changes in the abundance of fine scale habitat features, such as snags, logs, and legacy trees, or the influence of other factors, such as roads (WCS DEIS, USDA Forest Service 2011). The northern goshawk is believed to respond negatively to openings, or linear edges created by roads, and this species is known to be sensitive to disturbance, particularly during the breeding season. All of the PVGs that compose source habitat for goshawks occur in the project area except for PVG 4 (Table WL-8, Figure WL-5).

Modeled suitable habitat for the goshawk includes PVGs 3, 4, 6, 7, 8, and 9, within the HRV, and PVGs 2, 3, 4, 5, 6, and 7 when outside of the HRV. PVGs 2 and 5 have the potential to develop medium and large tree sizes in a high canopy class; however, these conditions would not occur under historical disturbance regimes (Hauffler 1994, Hauffler et al 1996). While there is support in the literature for goshawks using open-canopy stands (Reynolds et al. 1982, Hargis et al. 1994), use of mature forest stands with a high canopy closure (>70 percent) is more commonly described (Hayward and Escano 1989, Patla 1991, Hayward 1997). PVGs 2 and 5 have a limited capability to develop suitable nesting and foraging habitat for northern goshawks, except when outside historical disturbance regimes. For modeling nesting and foraging habitat, the literature supports selecting the medium (12.0–19.0 inches DBH.) and large tree size class (>20 inches DBH.) and moderate and high canopy closures (Hayward and Escano 1989, Hayward 1997, Patla 1991).

Risk factors for this species include nest tree removal and/or habitat modification from timber management activities, alteration of prey base habitats through vegetation management, stand-replacing wildfires, as a result of fire-excluded stands, and/or disturbance from human activities during the breeding season (USDA Forest Service 2011).

Table WL-8. Current condition of northern goshawk source habitat (acres).

Tree Size/Canopy Cover Class	PVG 2	PVG 3	PVG 4	PVG 5	PVG 6	PVG 7	PVG 8	PVG 9	Totals
Medium/Moderate	3,755	0	0	1,846	6,160	720	96	58	12,635
Medium/High	0	0	0	0	0	15	0	70	85
Large/Moderate	2,436	0	0	3,432	5,362	1,155	374	352	13,111
Large/High	0	0	0	2,622	4,751	1,142	162	221	8,898
Total	6,191	0	0	7,900	16,273	3,032	632	701	34,729

The Forest Plan provides direction for the management of goshawk nesting and post-fledging areas (PFAs) (WIST05 and WIGU07). Since goshawks are habitat generalists throughout much of their home range, this direction covers the more sensitive areas of their source habitat. Maintenance of the recommended canopy closure in PFAs is especially important for conservation of northern goshawk habitat. The goshawk also can use moderate and large tree size classes in medium and high canopy closure classes. This flexibility provides a cushion against loss, or declines, in old-forest habitat. Large-diameter snags are an important habitat component for some prey species of the northern goshawk and are future sources of large-diameter logs, another important habitat component for other prey species.

Management recommendations for the northern goshawk in the Southwestern United States (Reynolds et al. 1992, Youtz et al. 2008), referred to as the Southwest Guidelines, identify three major components of the home range: six nest areas, measuring at least 30 acres each and totaling about 180 acres, linked to a PFA of approximately 420 acres, and a foraging area of approximately 5,400 acres. Home range sizes have been documented from 1,409–8,649 acres (Squires and Reynolds 1997), with a mean of roughly 5,400 acres. Multiple nest sites are conserved within a PFA, because goshawks may shift to alternate nests over a period of years (Reynolds et al. 1992, Youtz et al. 2008). Although nest stands should be at least 30 acres, nest stand size and shape will depend on local forest conditions and structural components, which, in turn, dictate the size and shape of the PFA.

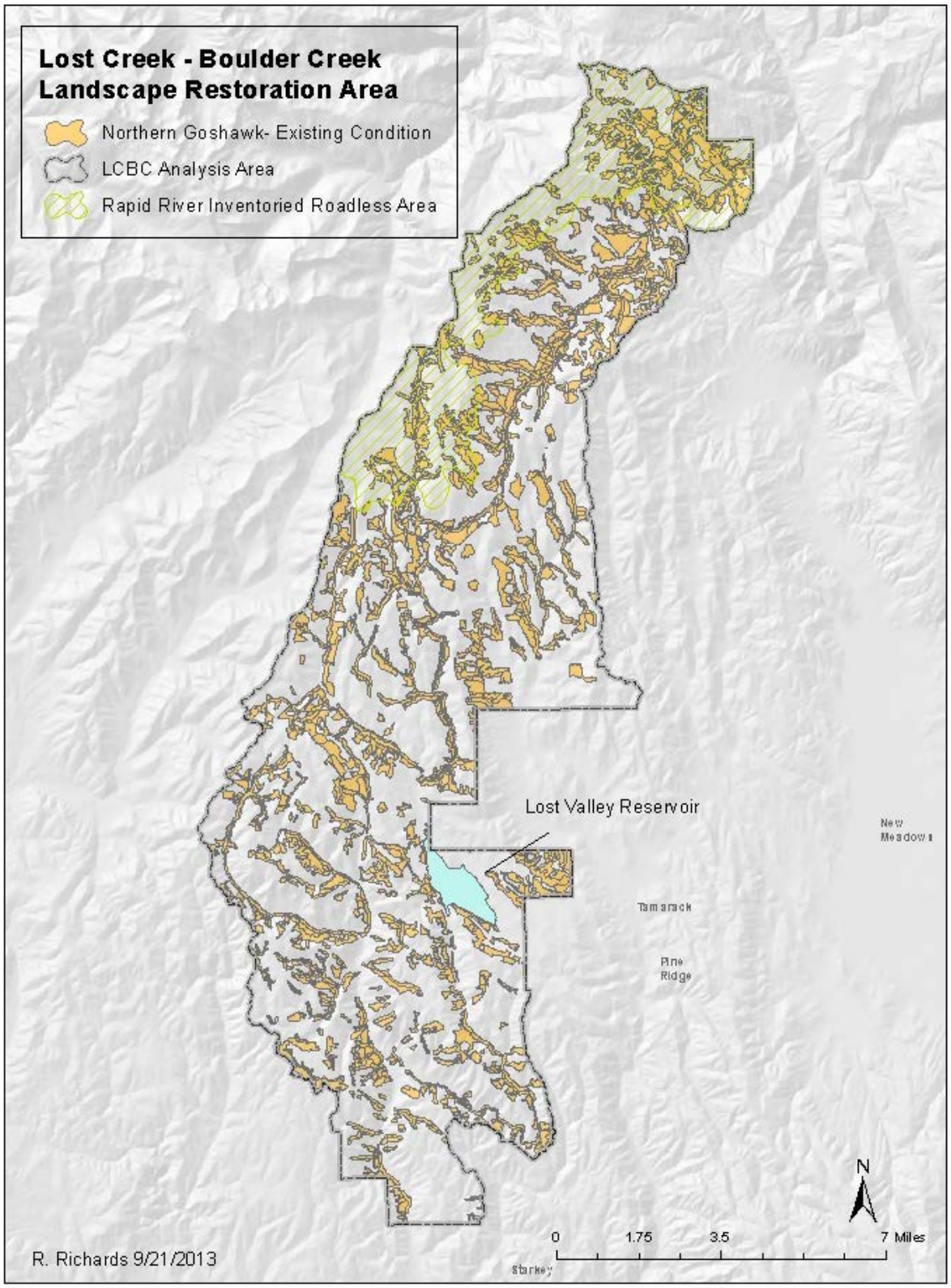


Figure WL-5. Northern Goshawk modeled source habitat and Post Fledgling Area, by Potential Vegetation Groups (PVGs) at Current Condition

Since 1975, approximately180+ goshawk observation records exist on the Forest, most from the west side of the Forest (WCS DEIS, USDA Forest Service 2011b). No reliable population trends exist for this species in Idaho.

The Forest Service conducted surveys seasonally from 2006 - 2013, to determine the status of known goshawk nests in the project area. Approximately seven confirmed goshawk nests are located within the project area. Given a home range size of 5,400 -6,000 acres (Youtz et al. 2008) and available habitat of about 34,729 acres (see Table WL-8 above), the project area (and immediately adjacent areas) should support about 6-7 goshawk home ranges, which appears to be verified from ground surveys.

Based on the clumping and overall distribution of known nests, seven PFAs were identified in the project area (Table WL-9). Six nest stands, including any known nest sites, were identified within each constructed PFA. The Forest Service will conduct field verification of all nest stands prior to implementation. Vegetation/restoration treatments within PFAs will be designed to protect the integrity of the next areas and associated PFA, as recommended in Youtz et al. (2008) and Reynolds et al. (1992), supplemented with site specific professional judgment (see PDF's for wildlife Chapter 2).

Table WL-9. Northern goshawk Post-Fledging Areas (PFAs) identified for the Lost Creek – Boulder Creek Landscape Restoration Project.

Post-Fledging Area (PFA)	Acres	Post-Fledging Area (PFA)	Acres
1. Chokecherry PFA		**5.Price Valley PFA****	
Chokecherry Total Nest Stands	274	Price Valley Total Nest Stands*	27
Chokecherry Foraging/Young Forest Area	444	Price Valley Foraging/Young Forest Area	550
Total	718	Total	577
2.Yellow Jacket PFA		**6.Upper Weiser PFA****	
Yellow Jacket Total Nest Stands	484	Upper Weiser Total Nest Stands	226
Yellow Jacket Foraging/Young Forest Area	263	Upper Weiser Foraging /Young Forest Area	291
Total	747	Total	517
3.Rock Jack PFA		**7. East Fork Lost PFA**	
Rock Jack Total Nest Stands	162	East Fork Lost Total Nest Stands	255
Rock Jack Foraging/Young Forest Area	368	East Fork Lost Foraging Area/Young Forest	241
Total	530	Total	496
4.West Fork Weiser PFA			
West Fork Weiser Total Nest Stands*	67		
West Fork Weiser Foraging/Young Forest	597		
Total	664		

*PFA primarily dominated by VSS3 **Price Valley and Upper Weiser PFA's are likely the same nesting pair and may be combined

Habitat Family 3. Forest Mosaic

Source habitats for Habitat Family 3 include the full spectrum of forest communities and structural stages. Wildlife species within Family 3 tend to be habitat generalists, but three of the four focal species have low, or isolated, populations, implying that other factors are inhibiting them. Family 3 source habitats have exhibited some decline in the large tree size class, but overall no major changes were noted from historical to current times, and modeling indicates that the amount of habitat available to Family 3 wildlife species is

currently within the HRV, largely because species in this family tend to be habitat generalists (USDA Forest Service 2011b). While source habitat quantity does not appear to be a concern, source habitat quality changes in the source environment may be a limiting factor for this family. The source environment is composed of vegetative and non-vegetative factors (e.g., human-caused disturbance) that can influence wildlife species' relative abundance and distribution throughout available source habitat (USDA Forest Service 2011b).

Canada Lynx

Because of its responsiveness to human influences in a forest landscape, the focal species for Habitat Family 3 in this analysis is the Canada lynx (USDA Forest Service 2011b). The Canada lynx is listed as a threatened species under the ESA. The Canada Lynx Conservation Assessment and Strategy (LCAS, Ruediger et al. 2000) guides lynx management in the contiguous United States within Lynx Analysis Units (LAUs). LAUs are defined as units that approximate an area of source habitat sufficient to provide a home range for a female lynx. LAUs and a lynx habitat model were identified through consultation with the USDI Fish and Wildlife Service (FWS) and are used to evaluate lynx habitat and the effects on lynx of agency activities. The project area falls within the Boulder Creek LAU (Figure WL-6).

The KEF for lynx is as a primary predator of herbivorous vertebrates (Marcot 1997, O'Neil et al. 2001). Key components of lynx habitat include denning habitat, foraging habitat, and travel corridors, provided by a mosaic of forest structures (Ruggiero et al. 1994). Lynx primarily forage in early seral forests comprised of seedlings and saplings (Marcot 1997, Wisdom et al. 2000, O'Neil et al. 2001). Small patches of old-forest with down wood provide denning habitat (Wisdom et al. 2000). Roads and/or over-the-snow trails increase the potential for human interactions, disturbance, and vulnerability to trapping (Wisdom et al. 2000, O'Neil et al. 2001). In winter, lynx are associated with persistent, deep-snow conditions (O'Neil et al. 2001).

Lynx use late-seral forests for denning, rearing their young, and hunting alternative sources of prey (Ruggiero et al. 1999). The common component of denning habitat appears to be large amounts of either logs or root wads, which provide escape and thermal cover for kittens. These late-successional forest stands also may provide refuge from inclement winter weather and summer drought.

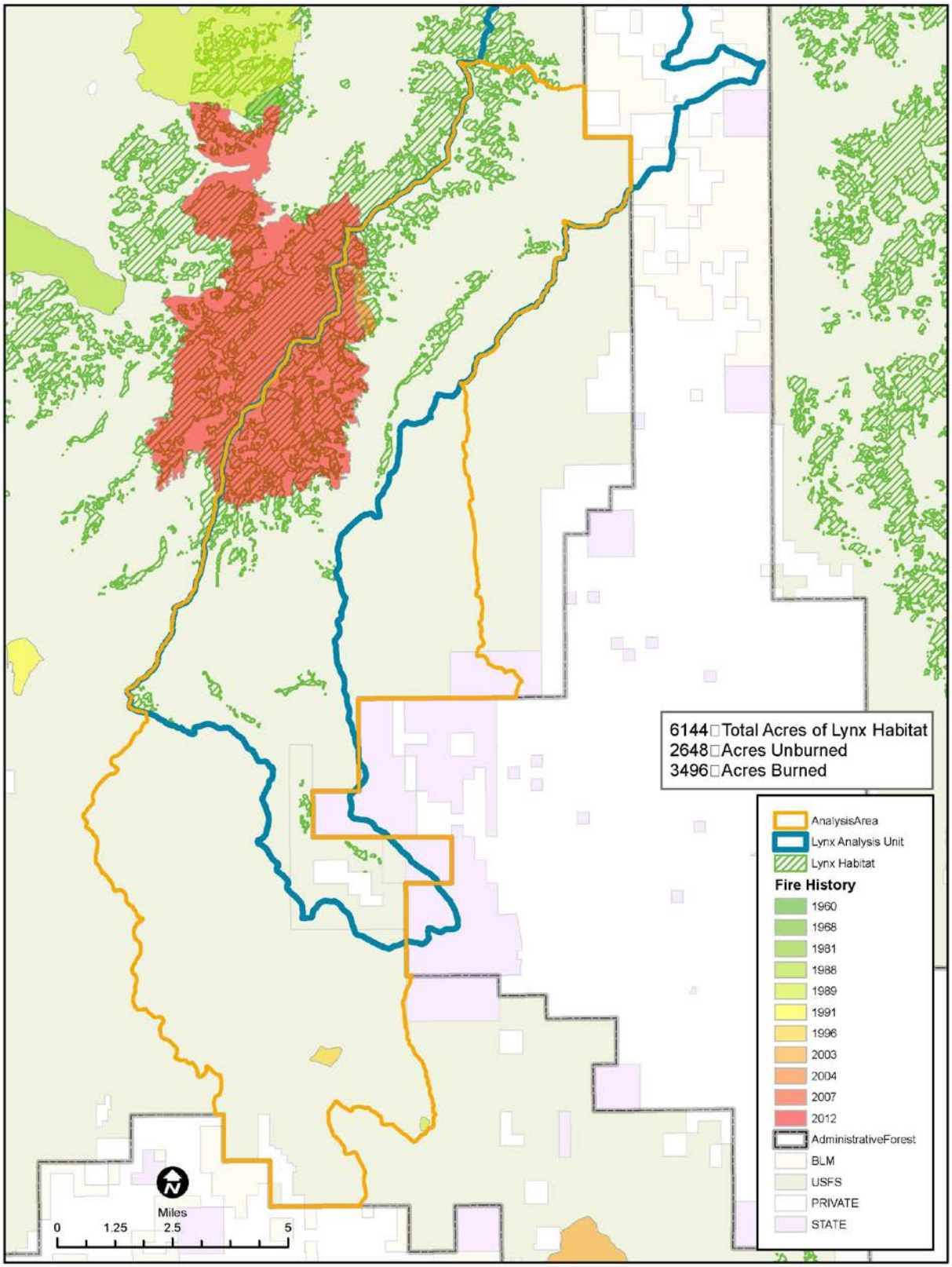


Figure WL-6. The Boulder Lynx Analysis Unit (LAU) and other LAUs surrounding the Project Area

Lynx foraging habitat supports its primary prey, the snowshoe hare (*Lepus americanus*) and/or important alternate prey, particularly red squirrels (*Tamiasciurus hudsonicus*), but also mice and grouse (especially during summer) (Ruggiero et al. 1994). Lynx primarily forage in early seral forests and in some mid-seral forests that support high numbers of prey. The best quality snowshoe hare habitats support a high density of young trees or shrubs (4,500 stems, or branches, per acre), especially with branches that protrude above the snow. These conditions may occur in early successional stands, following some type of disturbance, or in older forests with a substantial understory of shrubs and young conifers. Red squirrel densities tend to be highest in mature, cone-bearing forests with high quantities of logs (Ruediger et al. 2000).

Lynx are known to move long distances, but open areas are typically avoided by lynx and will disrupt their movements (Ruggiero et al. 1994). In general, suitable travel cover consists of coniferous or deciduous vegetation, 2.0 feet taller than the average snowfall, with a closed canopy adjacent to foraging habitat. Travel cover allows lynx movement within their home ranges and provides access to denning sites and foraging habitats.

In Idaho, lynx typically use montane and subalpine coniferous forests above 4,000 feet; primary habitat includes lodgepole pine, subalpine fir, and Engelmann spruce forests, and cool, moist Douglas-fir, interspersed with subalpine forest (Ruediger et al. 2000). Most coniferous forest structural stages provide lynx source habitats, with the exception of old-forest, single-storied stands. Riparian woodlands and shrublands also are source habitats. Vegetative communities capable of providing source habitat conditions include PVGs 3, 7, 8, 9, 10, and 11 (USDA Forest Service 2011b). Source habitat for lynx was assessed within the Boulder LAU (54,931 acres Forest Service total) (Figure WL-7). The total amount (potential and currently suited) of Canada lynx habitat in the Boulder LAU is 6,144 acres. About 3,496 acres of lynx source habitat was affected by recent wildfires, but less than half of that may be currently in an unsuited condition. If all burned acres are, in fact, unsuited then the amount of currently suited habitat is approximately 2,648 acres.

No current or historical records indicate lynx use the project area. Track surveys have not been conducted in existing Source habitat due to inability of access during winter. This portion of the Forest is not considered part of a core lynx population, due to the lack of observations and the isolated, disjunct nature of the habitat. Lynx are more likely to occur in the more remote areas of the northeastern part of the Forest but, even in that area, no recent sightings have occurred.

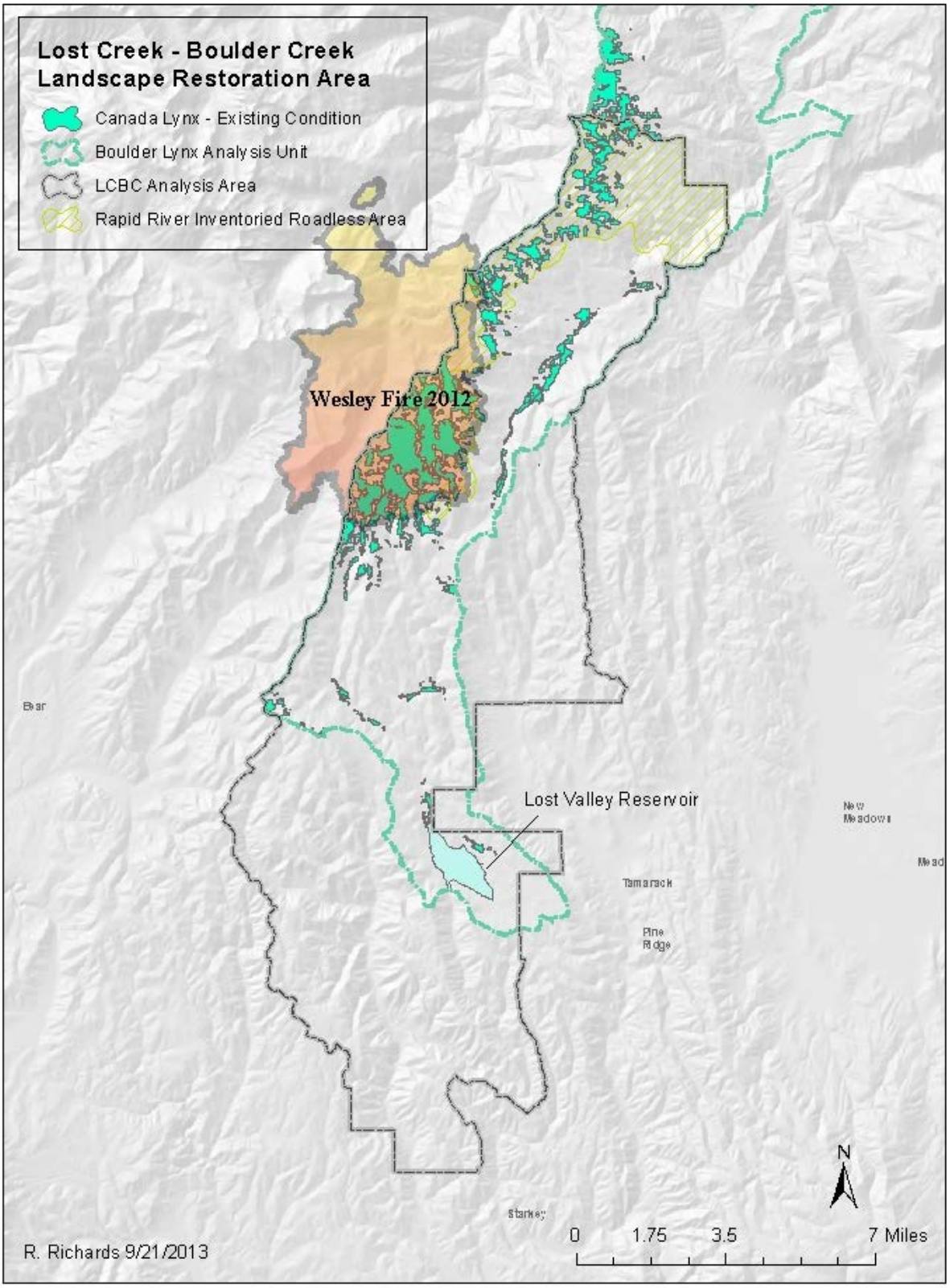


Figure WL-7. Canada lynx modeled source habitat in the Project Area (Boulder LAU), by Potential Vegetation Groups (PVGs).

Habitat Family 5. Forest and Range Mosaic

Source habitat for wildlife species in Habitat Family 5 is characterized by habitat requirements for Rocky Mountain elk. No focal species was designated for Family 5; however, elk is included in this analysis, because of its importance to local forest management and of special interest in elk management by the local communities.

Rocky Mountain Elk

The elk is designated a Species of Special Interest (SOSI) for the Forest (USDA Forest Service 2003b), but it is not a focal species (USDA Forest Service 2011b). Elk populations are managed by the IDFG, using Hunting Units designed to provide for a controlled harvest in late summer and fall hunting seasons. The Project Area is encompassed by Hunting Unit #23 and Hunting Unit #22.

Elk occur throughout the Forest and use a variety of habitats, ranging from open sagebrush-grasslands for foraging, to dense conifer stands for year-round hiding cover and winter thermal regulation. Forest Plan direction for elk habitat requires identifying and protecting calving areas, wallows, travel corridors (if known), mineral licks, security polygons, and winter range. Conifer stringers on open grassland hillsides create a classic elk habitat mosaic used through much of the snow-free season. Dense vegetation plays an important role in reducing the vulnerability of elk to hunting mortality. Elk calving areas consist of moderate- to open-density conifer stands on southerly slopes, with a moderate-to-dense shrub layer in the understory. Elk winter range consists of large areas that provide grass and browse forage with dense forested stands nearby for thermal and hiding cover.

The WCS DEIS (USDA Forest Service 2011b) considers wildlife habitat to be at risk when road densities exceed 1.7 miles of open NFS road per square mile. Elk habitat effectiveness and security is influenced by amount and proximity of forage and cover components, adequacy of hiding and thermal cover and open road densities. As hiding cover dissipates the influence of open roads on elk habitat effectiveness is magnified (S. Reinecker, IDFG Comment Letter for the Lost Creek-Boulder Creek Project, dated March 27, 2013).

Road density plays an important role in elk management. Typically, road densities > 1.0 mile of drivable road per square mile are considered detrimental to elk use and will likely increase vulnerability to hunting mortality (Hillis et al. 1991, Frederick 1991). Frederick (1991) noted results from several studies that show elk habitat effectiveness declines to 75 percent at an open road density of 1.0 miles of open road per square mile of land. At road densities of 2.0 to 3.0 miles of open road per square mile of land, elk habitat effectiveness declines to 25 percent. Road densities in the three 5th HU watersheds that encompass the Project Area roughly correlate to estimated elk habitat effectiveness proportions of < 60 percent, depending on available hiding cover adjacent to open roads and motorized trails (Lyon et al. 1985; USDA Forest Service 2003, Figure E-2, p. E-8).

The definition of drivable road can be legal or physical. Legally, the Forest Motor Vehicle Use Map (MVUM) displays those NFS roads, trails, and areas designated for motor vehicle use. These are authorized "open" routes. Other routes on the landscape may be physically drivable, but public use of those routes is unauthorized. As stated in FSM 7715.78, "If unauthorized routes are not designated, motor vehicle use on these routes is prohibited (36 CFR 261.13)." Many unauthorized routes occur in the Project Area.

Elk Security Area Analysis

Elk Security Areas (ESA) (Hillis et al. 1991) are often used as a measure of road density on elk vulnerability to hunting mortality. An area of 0.5 miles on either side of an open NFS road or trail is considered unsecure. The remaining blocks of suitable habitat are defined as Elk Security Areas. These security areas must have vegetation and terrain features that provide appropriate hiding cover for elk (Thomas 1979). Ideally, each security area should contain at least 250 acres of hiding cover. Hiding cover, using the strata vegetation classification system, is found in strata 23, 24, 34, and 35. Plantations (stratum 32) may provide hiding cover, but should be field verified. Terrain features may also provide cover, but cannot be modeled at this time.

The general method for analyzing ESAs was developed in cooperation with IDFG in 2004 (Project Record). It was agreed that a logical analysis unit was about 50,000 to 70,000 acres in size, which generally corresponded at the time with watersheds at the 5th level hydrologic unit. The goal is to maintain at least 30 percent of the 50-70,000-acre analysis area in ESA that contain a minimum of 250 acres of hiding cover. Since the Project Area is about 80,000 acres, we chose to analyze ESA for the Project Area.

The ESA analysis first buffered roads and motorized trails in summer by 0.5 miles (note that seasonal closures during the hunting season could provide additional security). Ten ESA were identified (numbered 0 to 9; see Figure WL-8) ranging in total size from 778 acres (ESA #8) to 13,084 acres (ESA #0). Within these ESAs the amount of hiding cover was determined (Table WL-10; Figure WL-9). All ESAs contained at least 250 acres of modeled hiding cover (range 248 – 6,742 acres). The ten ESAs total about 36,000 acres in size in which approximately 10,280 acres (29 percent) of hiding cover is provided in medium and large tree stands and 4,260 acres (12 percent) may be provided in plantations (additional field verification is necessary).

Table WL-10. Modeled Hiding Cover in each Elk Security Area (ESA)

Elk Security Areas					
ESA	**Total Acres**	**Existing Hiding Cover[4] in Acres**		**Percent of ESA in Hiding Cover**	
		Cover	Pot. Cover	Cover	Pot. Cover
0	13,084	5,417	1,325	41	10
1	2,093	259	637	8	30
2	3,945	1,269	103	32	3
3	996	100	215	10	22
4	1,468	265	146	18	10
5	5,647	1,430	1,126	25	20
6	2,012	381	180	19	9
7	4,083	767	329	19	8
8	778	51	197	7	25
9	1,946	344	6	18	0
Total	**36,052**	**10,283**	**4,264**	**29**	**12**

[4] Hiding cover is defined as “cover” based on strata 23, 24, 34, 35 and “potential cover” based on stratum 32.

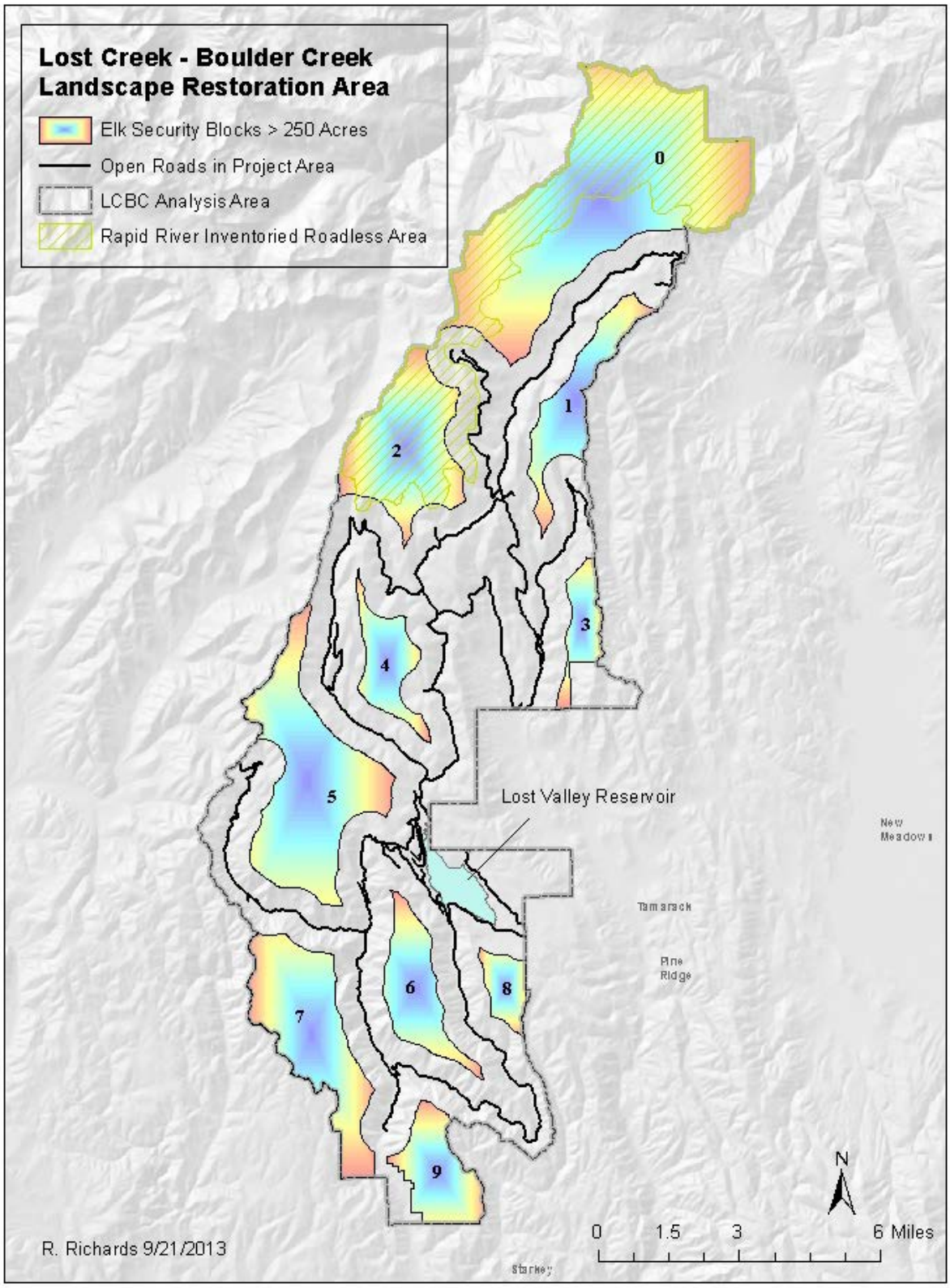


Figure WL-8. Elk Security Areas (on NFS lands only) identified by a 0.5 mile buffer on open roads and motorized trails in summer

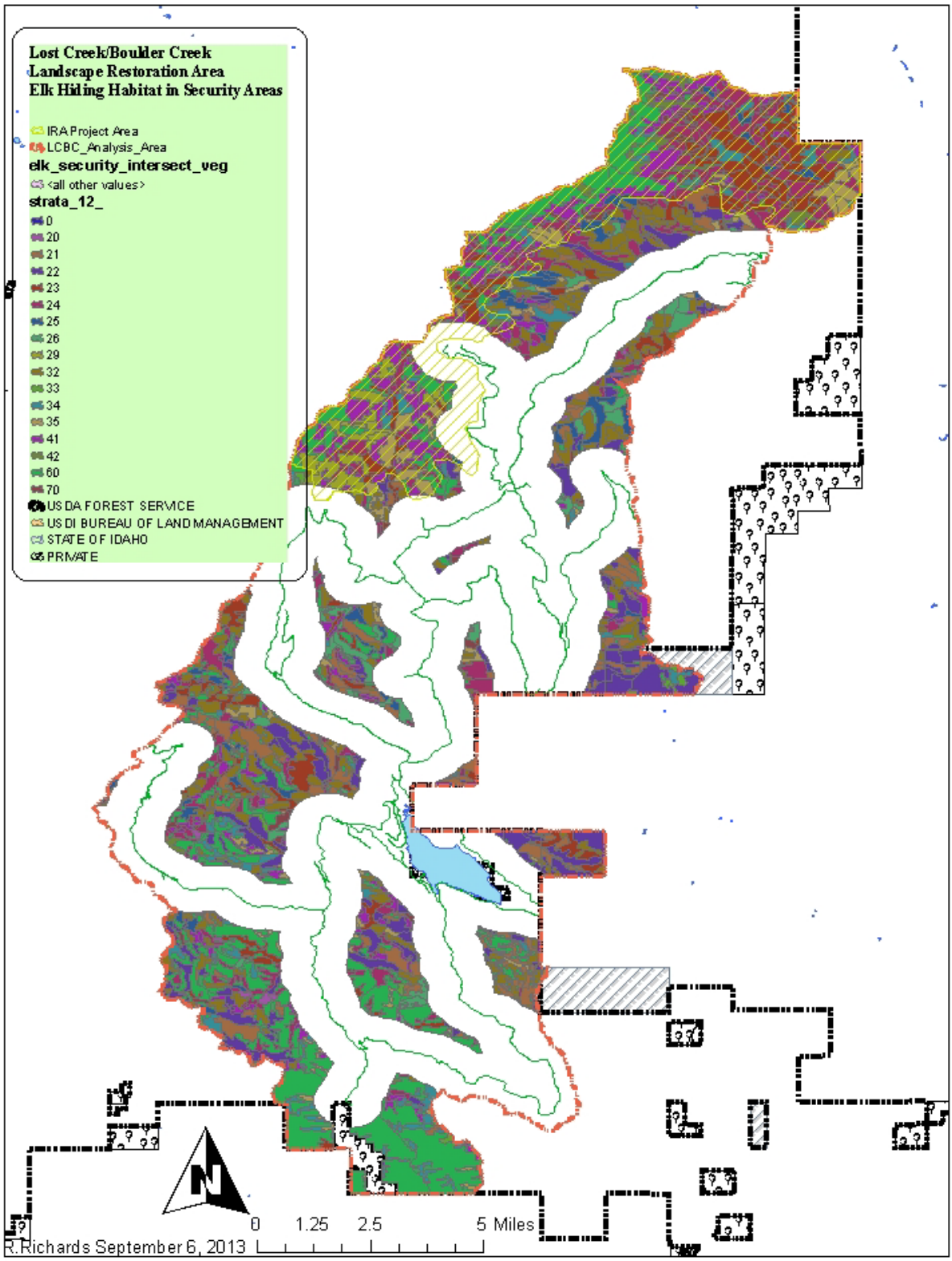


Figure WL-9. Existing vegetation in Elk Security Areas in the Project Area. Hiding cover is modeled using strata 23, 24, 34, 35. Potential hiding cover is modeled using stratum 32.

Unauthorized Roads and Closed System Roads

The ESA analysis addresses open roads, but, as discussed above, unauthorized use of closed roads also effects elk security and habitat use. The public has legal access on open NFS or authorized roads, but since many unauthorized roads exist on the landscape, these routes may be used for illegal access (Table WL-11). Alternatives that effectively close, or remove these roads and routes from the landscape prevent this activity more effectively.

Table WL-11. All Forest Service roads by 5th HUCs that may affect elk security. Open, Closed and Seasonal Roads are based on Motor Vehicle Use Map.

5th Level HUC Name	Open Roads (miles)	Closed Roads (miles)	Seasonal Roads (miles)	*Unauthorized Roads (miles)
Upper Weiser River	112.5	207.2	45.6	43.9
West Fork Weiser River	62	216.7	130.3	106.9
Middle Little Salmon River	58.4	128.1	42.9	22
Totals	232.9	552	218.8	172.8

* Unauthorized roads (172.8 miles) are a subset of the closed road column total and are for the Project Area only. They are closed to vehicle use under the Travel Plan but because they are on the landscape, are seasonally utilized, unlawfully by the public. Most do not have any physical barriers and are sometimes used by ATV's, UTVs, and 4-wheel drive vehicles during summer and fall seasons.

Reducing road density in an area reduces the vulnerability of elk to hunter mortality (Unsworth et al. 1993, McCorquodale et al. 2003, Rowland et al. 2005). The amount of hiding cover, the structure of that cover, the required size of a hiding cover patch, the road density needed to provide a security cover block of at least 250 acres, etc., have all been documented by multiple research studies throughout the west. Some of the most noted of these studies were conducted in Central Idaho (Unsworth et al. 1993), as well as northeastern Oregon (Rowland et al. 2005); therefore, much of the information available applies well to the Forest.

The Forest analysis of elk habitat security, of which hiding cover is a part, uses the Hillis Paradigm to guide habitat and road management for elk security. This strategy depends heavily on reducing road density to provide adequate amounts and distribution of secure habitat for elk. The Forest Plan addresses requirements for elk habitat security, but does not include the additive effects from predation by wolves. Research that either supports or disproves whether 30-acre patches of dense vegetation provides adequate hiding cover for elk in the presence of wolves could not be located. Managing the wolf population is the jurisdiction of the IDFG. Even though the Forest management strategy for elk is less than desired for the Project Area, the overall forest restoration objectives for the Project would be met and include consideration for future habitat conditions and an elk population at a level within historical conditions, which is the stated objective of the restoration effort.

Elk Winter Range

Relative to other wildlife species, elk are considered habitat generalists. They favor a mix of grassland/shrub landscapes and forested landscapes that provide important security cover. Habitat adaptability has allowed for the wide distribution of elk in the west. Generally considered grazing animals, elk feed on grasses, sedges, and forbs all year. They shift to more shrubs in the winter as non-woody plants become less available and nutritious. Sagebrush, bitterbrush, serviceberry, curl-leaf mahogany, and aspen

increase in importance as elk foods in the winter (Kufeld 1973, Wambolt 1998). In search of winter habitat, elk move to areas with less snow depth typically at relatively low elevations. And finally, areas of little human disturbance also comprise of elk winter range habitat.

In the project area, elk winter range habitat exists primarily on the south-west portion extending down to the Warm Springs Gulch and Rocky Gulch areas (Figure WL-10). When the winter range polygon is overlaid with the Project Area, approximately 6,894 acres may be available depending on snow depths. This habitat abuts large acreages of private land in the Starkey, Idaho and West Fork of Weiser River area that is generally lower in elevation than the project Area. As a result, substantial winter range habitat exists south of the Project Area encompassing the Council Valley which is primarily private ranches and small sections/blocks of State land.

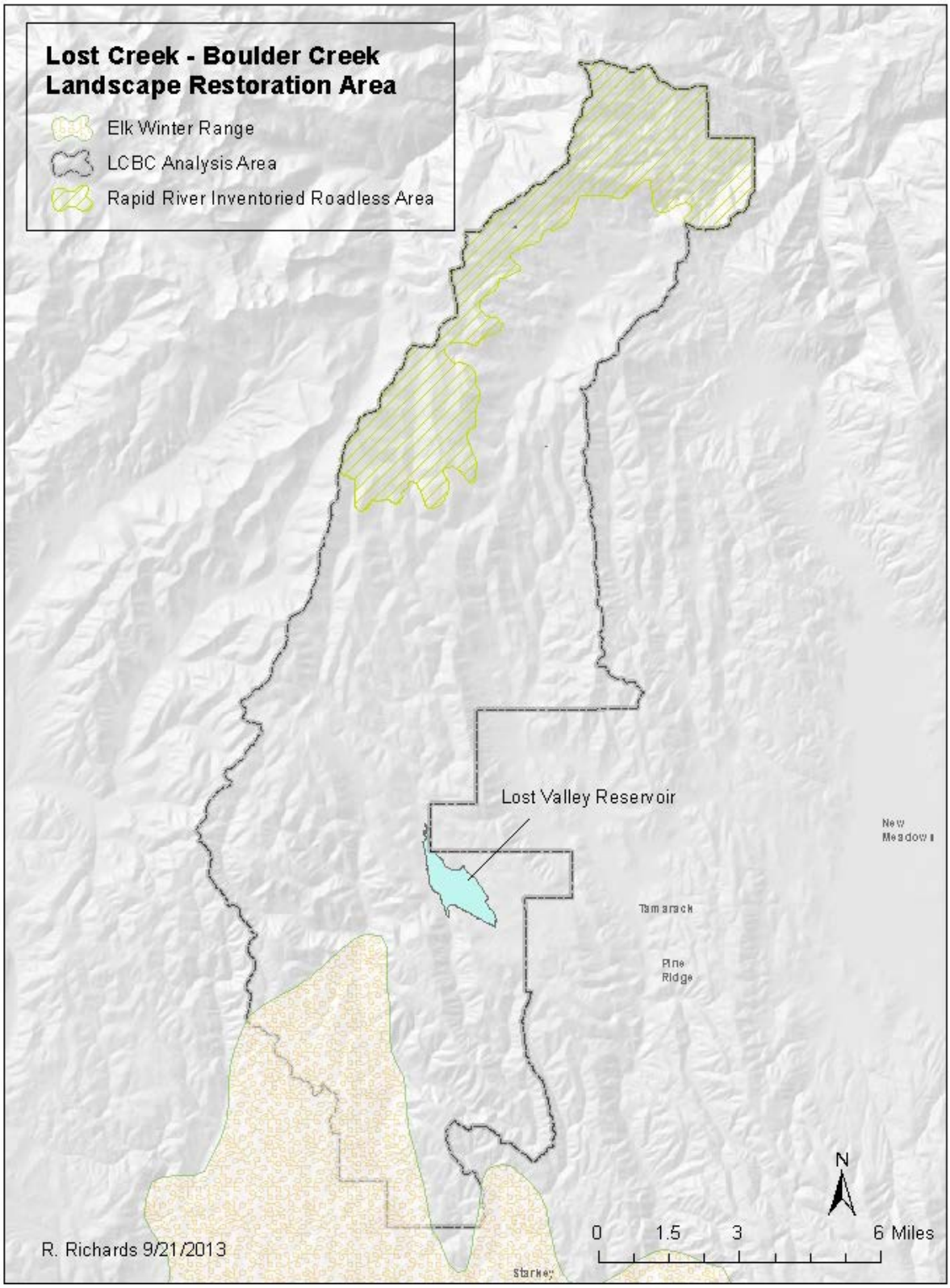


Figure WL-10. Elk winter range Lost Creek - Boulder Creek Project Area. Approximately 6,894 acres of winter range exists in the Project Area

Elk Calving

The lower elevational habitat (approximately 5,000ft. and lower, < 35 percent slope, with southerly aspect) on the southern end of the Project Area likely serve as elk calving habitat from mid-May through mid-June. At the macrohabitat scale, elk selected for cover components in combination with physical landscape characteristics (southern aspect) and forage components associated with deciduous and shrub cover (Barbknecht 2010). Locally it is difficult to determine exact areas where elk may calve in the Project Area, but is likely a function of adequate hiding cover for the calf, forage for the lactating cow and elevational limitations due to snowpack. In one research example, the calving area in the Gallatin (Montana) is located mainly on the upper limits of the winter range, as was found to be the case in other areas studied (Rush 1932, Darling 1937, Young and Robinette 1939, and Rust 1946). When using the elk winter range polygon for the PNF and overlapping elk calving habitat, approximately 1,656 acres exist in the Project Area. In years of low annual snow depths or early, warm, spring melt, as much as 5,577 acres of calving habitat may be present if areas of Lost Valley Reservoir and Price Valley are accessible (Figure WL-11).

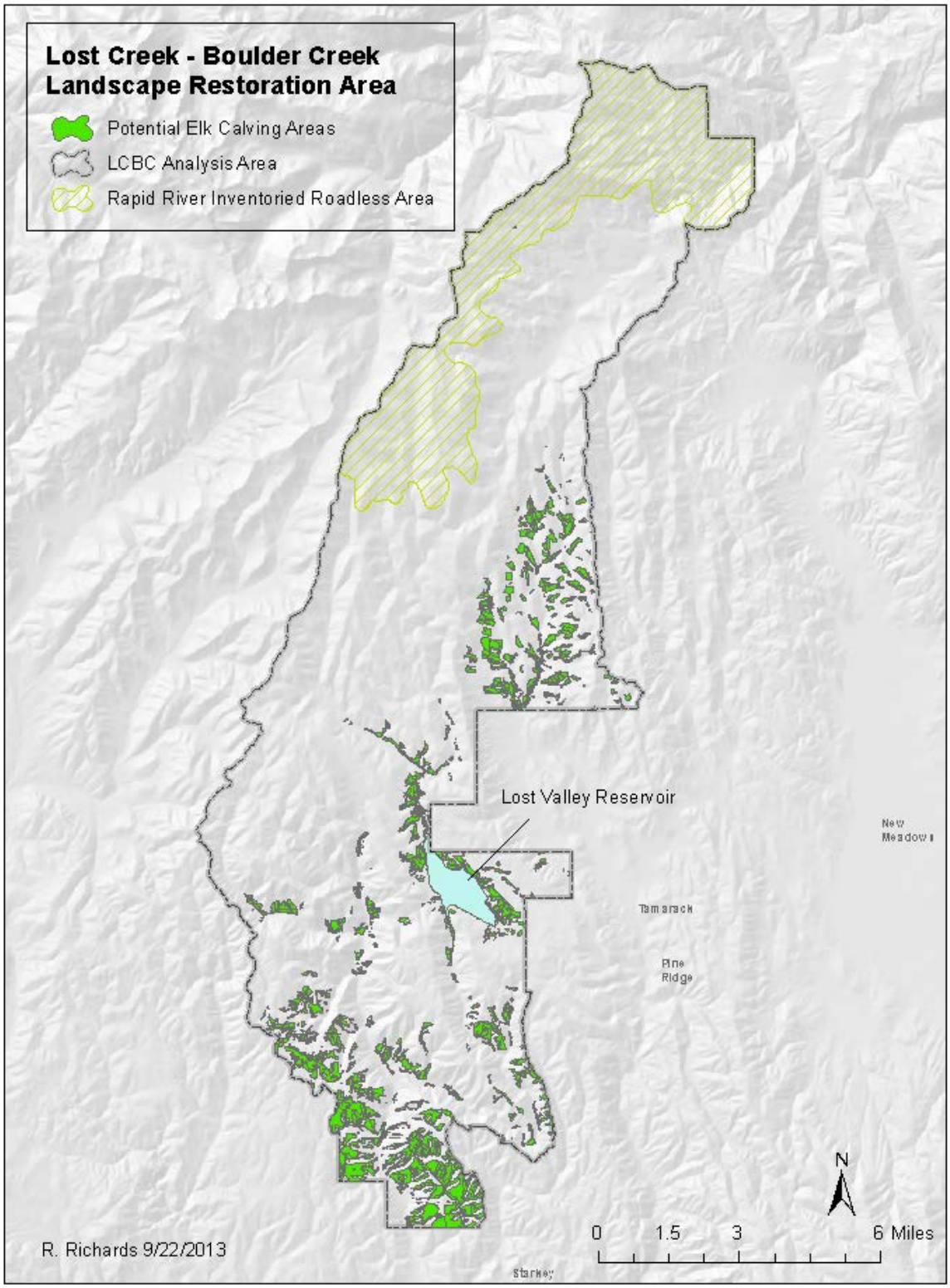


Figure WL-11. Potential elk calving areas, Lost Creek - Boulder Creek Project Area. Green polygons represent southerly aspect, < 35 percent slope, and < 5,000 ft. elevation with high cover and interspersed browse

Habitat Family 12. Grassland / Open-Canopy Sage

Source habitats in Habitat Family 12 include sagebrush (*Artemisia* spp.) communities that have co-dominate plant species of forbs, such as arrowleaf balsamroot (*Balsamorhiza sagittata*), buckwheat (*Eriogonum spp*.), lupine (*Lupinus spp*.), wild onion (*Allium spp*.), and bunchgrasses of various species. These sites may have a very low density of conifers, usually ponderosa pine or Douglas-fir, and variable densities and distributions of woody debris, boulders, and rock outcrops.

Northern Idaho Ground Squirrel

This analysis uses the northern Idaho ground squirrel as the focal species for this Habitat Family. Northern Idaho ground squirrels (NIDGS) have the most restricted geographical range of any ground squirrel species and one of the smallest home ranges among North American land mammals (Gill and Yensen 1992). The historical distribution of NIDGS included parts of west-central Idaho in Adams and Valley Counties. Originally considered to be one species, the Idaho ground squirrel is comprised of two subspecies: the Northern (listed as *Spermophilus brunneus brunneus*, but now recognized as *Urocitellus brunneus brunneus)* and Southern (*U.b. endemicus*) (Yensen 1991). The NIDGS is a Threatened species under the ESA (65 FR 17779), and a Recovery Plan was approved in 2003 (USDI FWS 2003). On the Forest NIDGS occurs only on the Council and New Meadows Ranger Districts.

Sagebrush source habitats for NIDGS typically include "scab" habitat, consisting of bunch grasses, high-desert forbs, sagebrush, basalt boulders or outcrops, and basalt loamy soils. These sites can have an open canopy of conifers, typically ponderosa pine, with a density roughly equivalent to around < 50-foot spacing between trees. Trees usually occur in unevenly distributed clumps, but some restored sites may have more even tree spacing due to a tie-to-timber management procedure used in earlier restoration projects. Adjacent stands of denser tree distribution and/or a dense shrub component are generally not used by the NIDGS, although altering sites with appropriate habitat components seems to be successful. Restoring NIDGS habitat in Family 12 sites is a goal in the Recovery Plan for the Northern Idaho Ground Squirrel (USDI FWS 2003).

NIDGS emerge in late March or early April and cease above-ground activity in late July or early August (Yensen 1991). Adult (> 2 years old) males emerge first, followed by adult females, then yearlings. Entrance into seasonal torpor is in the same approximate order—pups active approximately 1 month later than adult males. Ground squirrels are diurnally active (Sherman 1989). Hibernation in shallow soils makes the squirrel susceptible to freezing mortality during periods of lower snow depths and colder temperatures, particularly if individuals do not have an adequate fat reserve.

In suitable habitat, the squirrels are usually associated with deeper, well-drained soils generally on south-facing slopes with < 30 percent slope. Occupied, xeric meadows typically have a shallow (<3 feet to bedrock), reddish-brown to yellowish-red skeletal-loam or clay-loam soil (Yensen 1991). Vegetation in these drier meadows is often dominated by stiff sage (*Artemisia rigida*) or mountain big sage (*A. tridentata vaseyana*), with *Lomatium sp*., worm-leaf stonecrop (*Sedum stenopetalum*), *Allium sp.*, scarlet gilia (*Gilia aggregate*), (*Brodiaea douglasii*), and various bunchgrasses and other forbs. Figure WL-12 shows the current distribution of NIDGS modeled source habitat in the project area, as well as the distribution of known NIDGS colonies.

The NIDGS is primarily granivorous and ingests large amounts of grass seeds, stems, and herbs to store energy for the long period—August through late March—it spends in torpor (Yensen 1991). Habitat loss

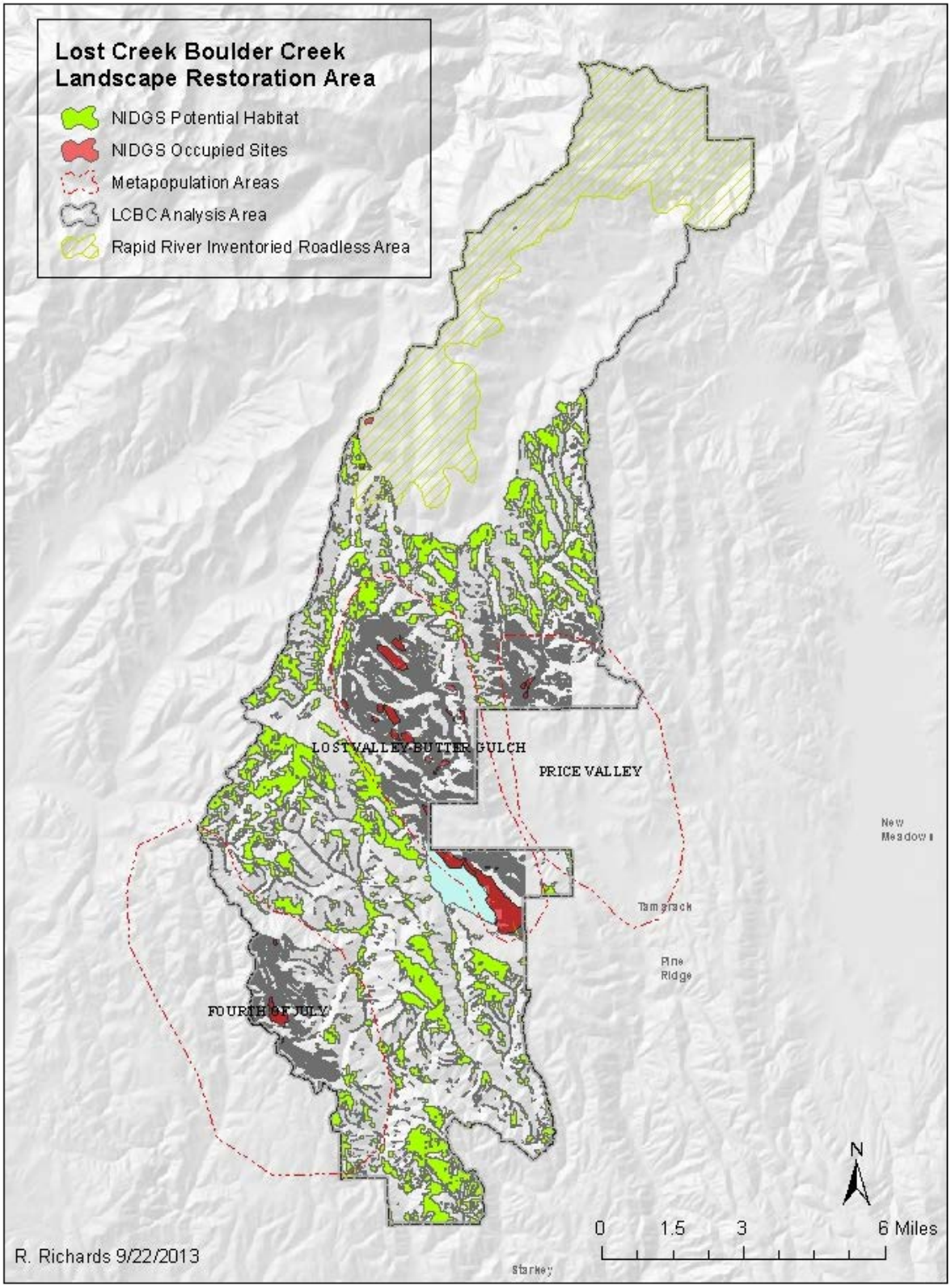


Figure WL-12. Northern Idaho ground squirrel (NIDGS) known colonies (n = 14), modeled Source Habitat by Potential Vegetation Groups (PVGs) and metapopulation areas for the Project Area

and fragmentation, caused by wildfire exclusion and forest encroachment into former meadow habitats, were likely the main causes of population decline. Other limiting factors include competition with Columbian ground squirrels, changes in land use (vegetation altered by fire suppression, road construction, and some logging practices), increased public access (off-highway vehicle [OHV] use and recreational shooting), and environmental stochastic events (winter mortality, predation, and disease) (E. Yensen, College of Idaho, pers. commun. 2010).

Approximately three hundred NIDGS are documented on the PNF for the project area occupying approximately 1,190 acres (FS Wildlife Sightings Database 2012, IFWIS 2012). Extensive suitable or restorable habitat also occurs in the Project Area. Known occupied NIDGS sites include: 1) Price Valley Guard Station, 2) 4th of July Creek, 3) Lick Creek Lookout, 4) Lick Creek Lookout - Lower, 5) East Fork Lost Creek, 6) Rocky Top, 7) Lower Lost Creek, 8) Lost Valley Reservoir, 9) Slaughter Gulch, 10) Middle Lost Creek, 11) Upper Butter Gulch, 12) Upper Lost Creek, 13) 4th of July Creek, West, and 14) Lower Butter Gulch.

In addition to the above information, three metapopulation areas as outlined in the 2003 northern Idaho ground squirrel recovery plan (revision in prep.) also exist in the project area. These metapopulation areas are: 1) 4th of July, 2) Lost Valley-Butter Gulch, and 3) Price Valley. The metapopulation areas serve as the core of the existing known populations of NIDGS and are the priority for habitat treatment.

Habitat Family 13. Riverine Riparian and Wetland

Source habitat for Habitat Family 13 includes streams, ponds, lakes, wetlands, and the associated riparian zones for each of these types of water bodies. Project Area streams include Lost Creek and Boulder Creek including their tributaries and one reservoir, Lost Valley. Wetlands in the Project Area are associated with drainage around the lake and in wet sites created by snow melt, seeps, and springs. Riparian zones include the full range of habitats found in the Project Area, with the inclusion of plant species directly associated with open water or very high soil moisture. Tree size classes, canopy closures, species composition, and vegetation patch size and shape will vary in riparian habitats, depending on many microsite factors, including soil type, aspect, elevation, soil moisture, distance to open water, and disturbance types. Wildlife focal species for Family 13 source habitats require different classes of water type and vegetation structure.

Bald Eagle

The bald eagle was delisted in 2007, except in northern Arizona, and is now designated as a Region 4 Sensitive species. The bald eagle also is protected under the Bald Eagle and Golden Eagle Protection Act (Eagle Act) of 1940, as amended. Following delisting, the FWS approved the National Bald Eagle Management Guidelines (USDI Fish and Wildlife Service 2007), to provide federal guidance in managing disturbance to bald eagles. The bald eagle Guidelines provide specific information on how to limit disturbance to bald eagles, based on project location, breeding period for the local area, nest or roosting sites, and type of disturbance.

Bald eagles are relatively common year round in the Meadows Valley and a nesting pair produce offspring most years at the Lost Valley Reservoir nest within the project area. Currently, the nest appears to have at least one eaglet (author pers. obs.). Nesting habitat elsewhere in the project area is limited. Although nesting could occur along Lost Creek south of the reservoir and along Boulder Creek on the north end of the project area, road placement along the riparian corridor likely prohibit nesting due to vehicle disturbance (Figure WL-13). We buffered a 1-mile area along these two streams, to identify habitat that

may be used for nesting and roosting. No wintering populations of bald eagles have been identified for the Project Area, although wintering eagles do occur along rivers and lakes primarily to the east of the project. If wintering bald eagles used portions of the Project Area, night roosting would likely be in large tree size class stands within a 1-mile corridor near these water bodies (Anthony et al. 1982, USDI Fish and Wildlife Service 2007, Joshi 2009).

Nest surveys will be conducted during spring at the known nest at Lost Valley Reservoir and reported to IDFG. Within the 1 mile buffer along Lost Creek and Boulder Creek, annual surveys will be conducted to determine presence/absence and if bald eagles are documented the Bald Eagle Guidelines would be implemented. Any conflict with planned road activities (decommissioning, temporary road construction, etc.) would lead to Forest contact with the FWS and IDFG, to develop an interagency plan for disturbance management at the site.

Bald eagle nest surveys will be conducted specifically for those related activities around Lost Valley reservoir and any improvements to recreation infrastructure that might affect the existing nest. Although bald eagles have been identified in the Project Area it is unlikely their source habitat would be negatively affected by restoration activities due to implementation of the National Bald Eagle Management Guidelines. These guidelines require no overstory tree removal within 660 ft. during courtship and/or nesting times.

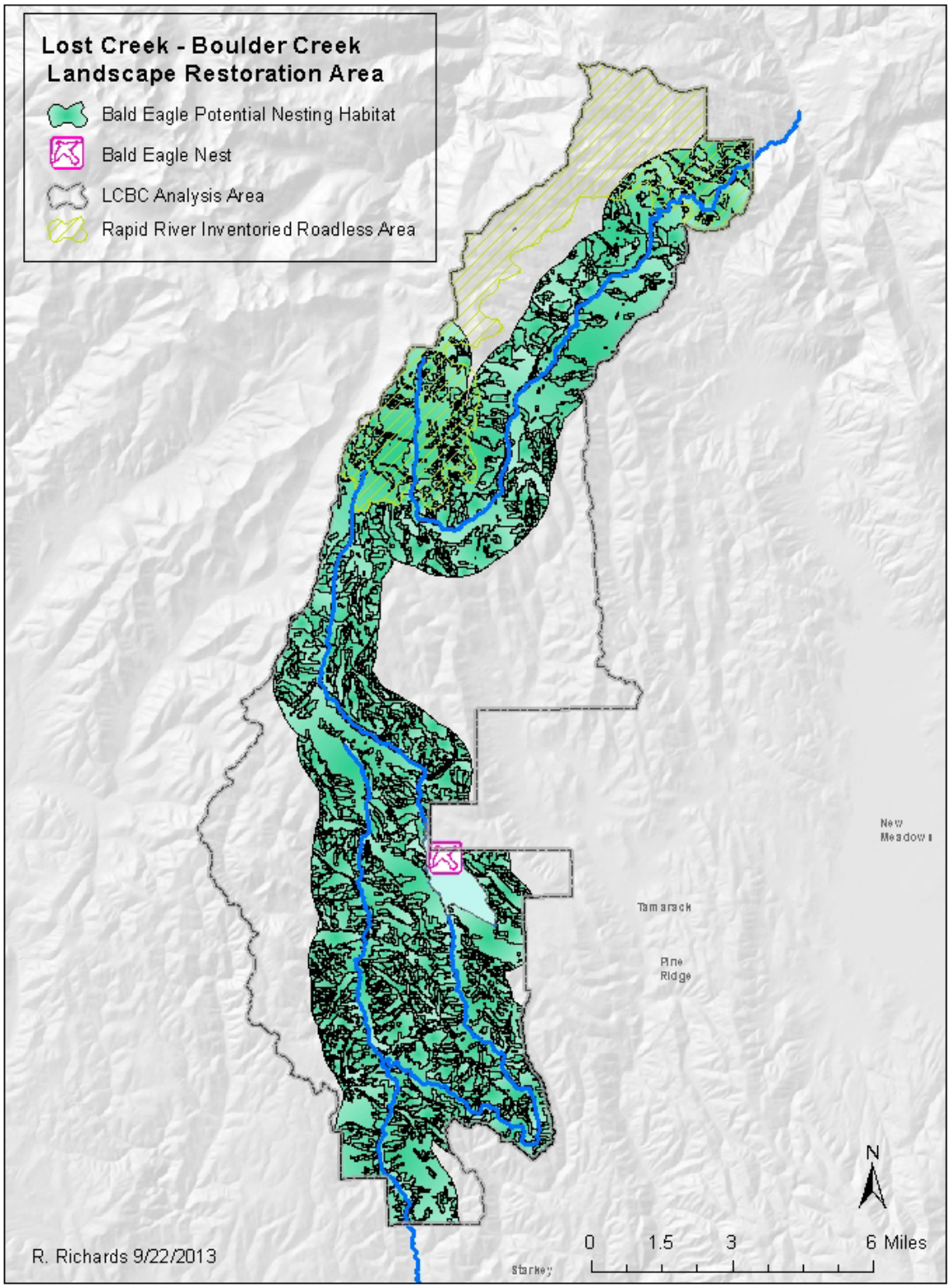


Figure WL-13. Bald Eagle modeled source habitat in the Project Area and known bald eagle nest. The map shows local rivers and larger perennial streams, with a 1-mile night-roosting buffer, to illustrate where bald eagles might be expected to occur in, or near, the Project Area

3.6.4 Direct and Indirect Environmental Effects

Comparisons of effects are organized by species or habitat (e.g., white-headed woodpecker, snags) rather than by alternative. This organization was chosen to more easily see habitat changes by alternative for each species or habitat component (e.g., old forest).

Effects analyses focus on the indicators described for wildlife in Chapter 1. In particular, these include discussions of the effects on the forested habitat quantity (acres) and quality (old forest and snags, patch and pattern) for the following species of concern: white-headed woodpecker, pileated woodpecker, flammulated owl, three-toed woodpecker, boreal owl, fisher, great gray owl, northern goshawk, northern Idaho ground squirrel, Canada lynx, wolverine, and Rocky Mountain elk. Effects analyses also consider changes in open road densities and associated effects to snags and elk security, as well as the effects of other project activities that may cause disturbance or affect non-forested habitats, particularly rangeland habitats used by the northern Idaho ground squirrel.

Old-Forest Habitat

Alternative A - No Action

No old forest has been identified in the Project Area. Under the No Action Alternative, no direct effects would occur to old-forest habitat, because no project –related activities would occur.

Indirectly, the effects of the No Action alternative would vary, depending on forest stand conditions. Stands composed of PVGs that are typically denser with longer fire return intervals (e.g., wetter PVG 6) should naturally develop old-forest characteristics. Conversely, forest vegetation types that typically experienced a more frequent fire interval are expected to move away from old-forest conditions, due to increased understory densities and reductions in the percentage of seral tree species. The lack of prescribed fires would ultimately move these stands further away, in both composition and process, from old-forest conditions.

Without these treatments, the likelihood of larger or, even, stand-replacing, wildfires would remain higher than under the HRV, especially in the low-elevation, ponderosa pine-dominated forests. Uncharacteristic wildfires have the potential to alter these forests to a successional stage that could further slow the attainment of old-forest characteristics for many years.

Effects Common to All Action Alternatives

Over time, restoration treatments are expected to enhance stand conditions and allow medium trees to faster achieve, and large trees to maintain, large tree size class than if left untreated. Stands would be composed of a higher percentage of seral tree species, which is beneficial for Habitat Family 1. Conversely, the stands would be more open and fewer signs of decay and aging would be present, which is less beneficial for most wildlife species in Habitat Family 2. Each stand should be reviewed to determine if it provides, or could provide, old forest habitat. Through cooperation of wildlife biologists and vegetation management specialists, provisions should be made to maintain the natural components (beyond tree size class and canopy cover class) of old forest habitats as described in Appendix E of the draft EIS for the WCS.

Cumulative Effects

Ongoing and/or foreseeable future activities that could add to impacts within the analysis area are summarized in the DEIS. Cumulatively, all alternatives would contribute to the development of future old-

forest habitat attributes on NFS lands, even though the action alternatives use timber harvest and reintroduction of fire in an attempt to restore desired, old-forest habitat conditions more rapidly. Timber harvest activities on State and private lands within the Project Area boundary are expected to remove large trees and impede conservation of old-forest habitats of those stands.

Snag Habitat

Alternative A - No Action

Under the No Action Alternative, existing natural processes would continue to create snags and existing fuelwood harvest would continue to remove snags near roads. Snag levels appear to be present in appropriate densities and size classes on the Westside of the Forest for which this project located (USDA Forest Service 2011b, pp. 98, 102). PVG 2 is slightly below the historical average (-1.7) and is likely due to lack of fire and high road densities which allow for more fuelwood harvest. Indirectly, more snags may be created as stand densities and processes that cause snags (i.e., insects and disease) increase. The size of these snags may be smaller than what would be attained by having larger diameter live trees, which, in turn, become larger diameter snags.

The risk of uncharacteristic wildfires is expected to increase. Wildfires may create more snags, but they remove live trees that would likely provide a stable supply of snags over time.

Effects Common to All Action Alternatives

Under the action alternatives, direct removal of snags would not be allowed (see Project Design Features), but a limited amount of snags could be cut during harvest activities for safety concerns. Also, stand conditions (e.g., density, disease) that create snags are likely to be reduced in the treated areas. Prescribed fire should create more snags, particularly in the smaller size classes. Few large trees are expected to be burned, so few large snags would be created. Overall, harvest treatments are expected to decrease snag levels slightly, while subsequent prescribed fire may increase the number of snags.

Open roads can play an important role in snag levels. Collectively, the project area exhibits approximately 473 miles of roads or routes that are drivable. The public can legally access fuelwood only on open NFS or authorized roads, but since many unauthorized roads exist on the landscape, firewood cutters can use these routes for illegal access. Alternatives that close, or remove, open authorized roads and unauthorized routes from the landscape prevent this activity more effectively. All of the Alternatives decommission some unauthorized routes, but Alternative C decommissions substantially more routes (about 132 miles total) than the other action alternatives that would remove about 51 to 69 miles total. Open NFS roads provide most of the access for firewood cutting. Under action Alternatives B, D and E, 3.6 miles of existing non-system road would be improved and added to the transportation system. This new system road would be gated to prevent motorized access and to alleviate access to standing snags that might be otherwise cut for firewood. Alternative C is expected to result in greater snag conservation and greater benefits to a number of wildlife species than the other alternatives.

Cumulative Effects

Ongoing and/or foreseeable future activities that could add to impacts within the analysis area are summarized in the DEIS. Actions on NFS lands that may cumulatively impact snags include ongoing fuelwood removal on open NFS roads, as well as short-term decisions to open closed roads specifically for firewood access. In addition, some firewood cutters pioneer trails off of existing roads and unauthorized

routes to access firewood. Such actions are expected to continue negatively impacting snag levels. Currently, private and State lands open to timber harvest are expected to retain low snag levels. Future actions on these lands are expected to further reduce snags. Alternative C decommissions more existing unauthorized roads and reduces overall road densities more than any other Alternative, resulting in the greatest cumulative offset for other actions in the project area. Prescribed fire would cumulatively benefit snag creation.

Habitat Family 1—White-headed Woodpecker

Alternative A - No Action

Habitat Family 1 species, as represented by the white-headed woodpecker, are associated with large trees and low (approximately 25-50 percent) canopy closures. Currently, the project area is estimated to contain 1,735 acres of fragmented source habitat (Figure 21), which likely does not support a breeding territory for the white-headed woodpecker (approximately 523-845 acres are needed to support one territory) due to the fragmented, scattered nature of the stands.

Currently canopy closures in the large tree class are greater than what white-headed woodpecker prefer. The canopy closure issue also applies to the medium size tree class where tree densities are higher than what they would be historically. These existing conditions and maintenance of existing tree densities and canopy cover would continue the decline of potential source habitat, thus excluding white-headed woodpeckers from the project area.

Effects Common to All Action Alternatives

Implementing the action alternatives would restore source habitat for white-headed woodpeckers. Following harvest and burn restoration treatments, depending on the alternative, source habitat would increase by approximately 19,156 - 28,600 acres (Table WL-14, Figures WL-15-18). The most notable changes would occur in PVGs 2, 5, and 6. Table WL-14 also shows the rate of change for each alternative.

Table WL-12. Change in white-headed woodpecker habitat by Alternative and Potential Vegetation Group (acres) for large tree and low canopy, immediately post-harvest (short-term).

	No Action	Alternative B	Alternative C	Alternative D	Alternative E
PVG 1	342	443	402	448	407
PVG 2	304	2,575	1,917	2,558	2,318
PVG 3	---	---	---	---	---
PVG 5	893	5,012	3,802	5,057	4,895
PVG 6	196	4,265	680	6,029	4,849
Totals	1,735	12,296	6,801	14,193	12,469

Table WL-13. Change in white-headed woodpecker habitat by Alternative and Potential Vegetation Group (acres) for medium tree and low canopy that will become habitat 5-30 years post treatment (long-term).

	Alternative B	Alternative C	Alternative D	Alternative E
PVG 1	1,152	1,152	1,152	1,089
PVG 2	6,869	6,197	6,999	6,561
PVG 3	---	---	---	---
PVG 5	4,322	3,915	4,323	4,295

	Alternative B	Alternative C	Alternative D	Alternative E
PVG 6	3,752	2,826	3,769	3,375
Totals	16,095	14,090	16,243	15,320

Table WL-14. Change in white-headed woodpecker habitat by Alternative and Potential Vegetation Group (acres) short and long term combined.

	No Action	Alternative B		Alternative C		Alternative D		Alternative E	
PVG 1	342	1,595	+366%	1,554	+354%	1,600	+368%	1,496	+337%
PVG 2	304	9,444	+3,007%	8,114	+2,569%	9,557	+3,044%	8,879	+2,821%
PVG 3	---	---		---		---		---	
PVG 5	893	9,334	+945%	7,717	+764%	9,380	+950%	9,190	+929%
PVG 6	196	8,017	+3,990%	3,506	+1,689%	9,798	+4,899%	8,224	+4,096%
Totals	**1,735**	**28,390**	**+1,536%**	**20,891**	**+1,104%**	**30,335**	**+1,648%**	**27,789**	**+1,502%**

Based on long-term modeled habitat increases, Alternatives B and D may restore 34-58 white-headed woodpecker home ranges, while Alternative C may restore 24-39 home ranges, and Alternative E would likely restore 33-53 home ranges. More importantly, all the action alternatives improve the patch size and distribution of the source habitat patches (Figures WL-15-18) compared to the current conditions (Figure 14). Note the small size and isolated distribution pattern of these habitat polygons in Figure WL-14. Also note the general increase in habitat polygon numbers and size, and the denser distribution pattern of these habitat polygons, in the action Alternatives (Figures WL-15-18).

If these home ranges become occupied, population trends are likely to improve over time. In order for long-term breeding success and increased population trends to continue, maintenance tree thinning and prescribed burns will be required to support these habitat conditions within the HRV. If future thinning and burning does not occur, these habitat improvements will eventually deteriorate to a point where forested stands in the Project Area are once again outside of the HRV, causing breeding and population declines in white-headed woodpeckers across the landscape.

Cumulative Effects

Ongoing and/or foreseeable future activities that could add to impacts within the analysis area are summarized in the DEIS. Actions on NFS lands that may cumulatively impact this species include ongoing fuelwood removal. Currently, private and state lands open to timber harvest are expected to have very low levels of seral large tree species, old forest conditions, and snags. Future actions on these lands are expected to further reduce these important habitat components for this species. Alternative C decommissions more unauthorized roads than any other alternative, resulting in the greatest cumulative offset for other actions in the Project Area. All action alternatives would increase the amount of white-headed woodpecker habitat in the Project Area, providing cumulative benefits that will help offset past losses on NFS and other lands. Prescribed fire treatments by Alternative have the potential to recruit snags and improve foraging and nesting habitat that white-headed woodpeckers prefer. The Rapid River IRA is included in the cumulative effects area for wildlife and provides 216 acres of fragmented habitat that is distributed in small, isolated acreages.

Determinations

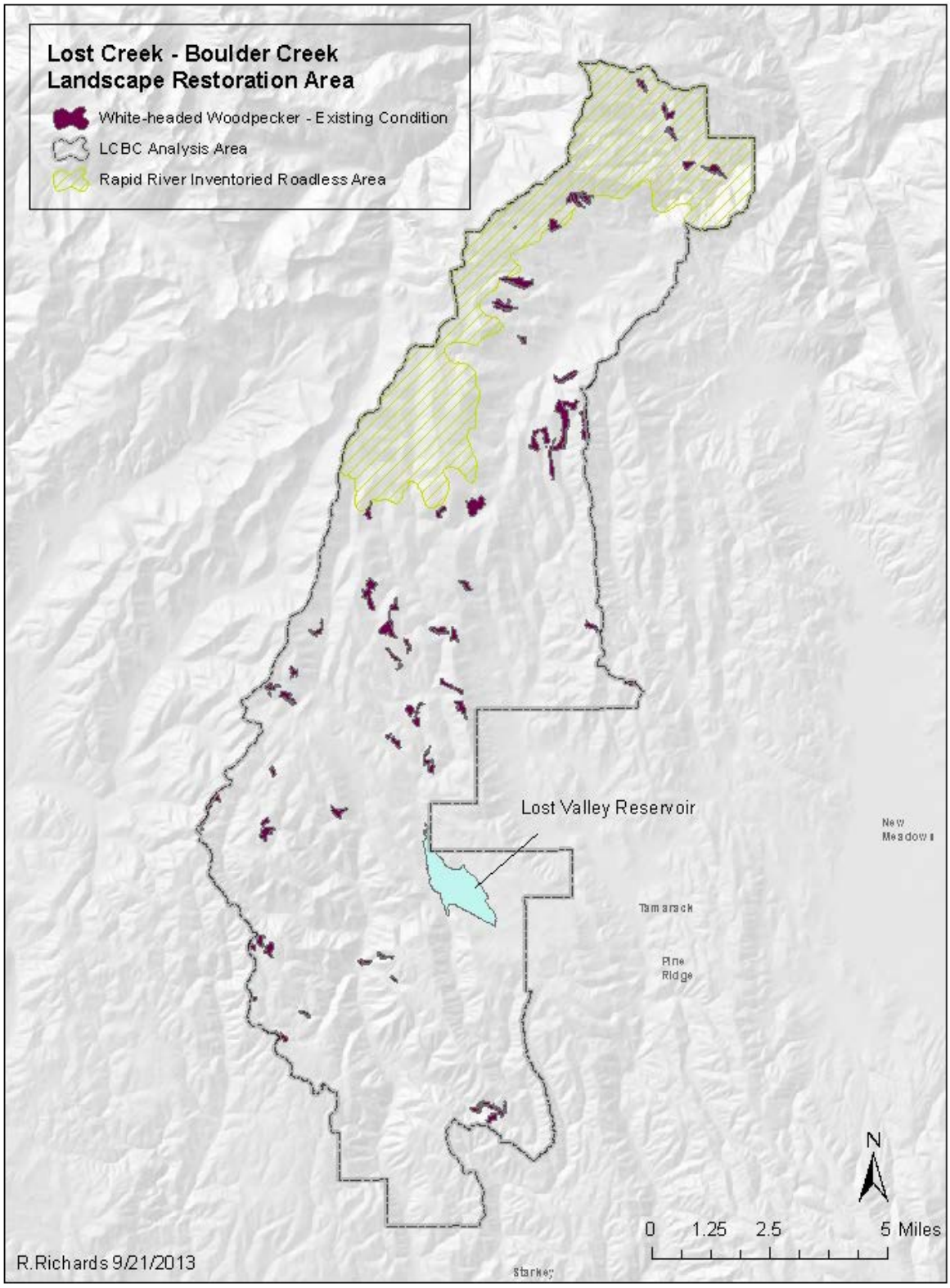


Figure WL-14. White-headed woodpecker modeled source habitat at Current Condition (Alternative A).

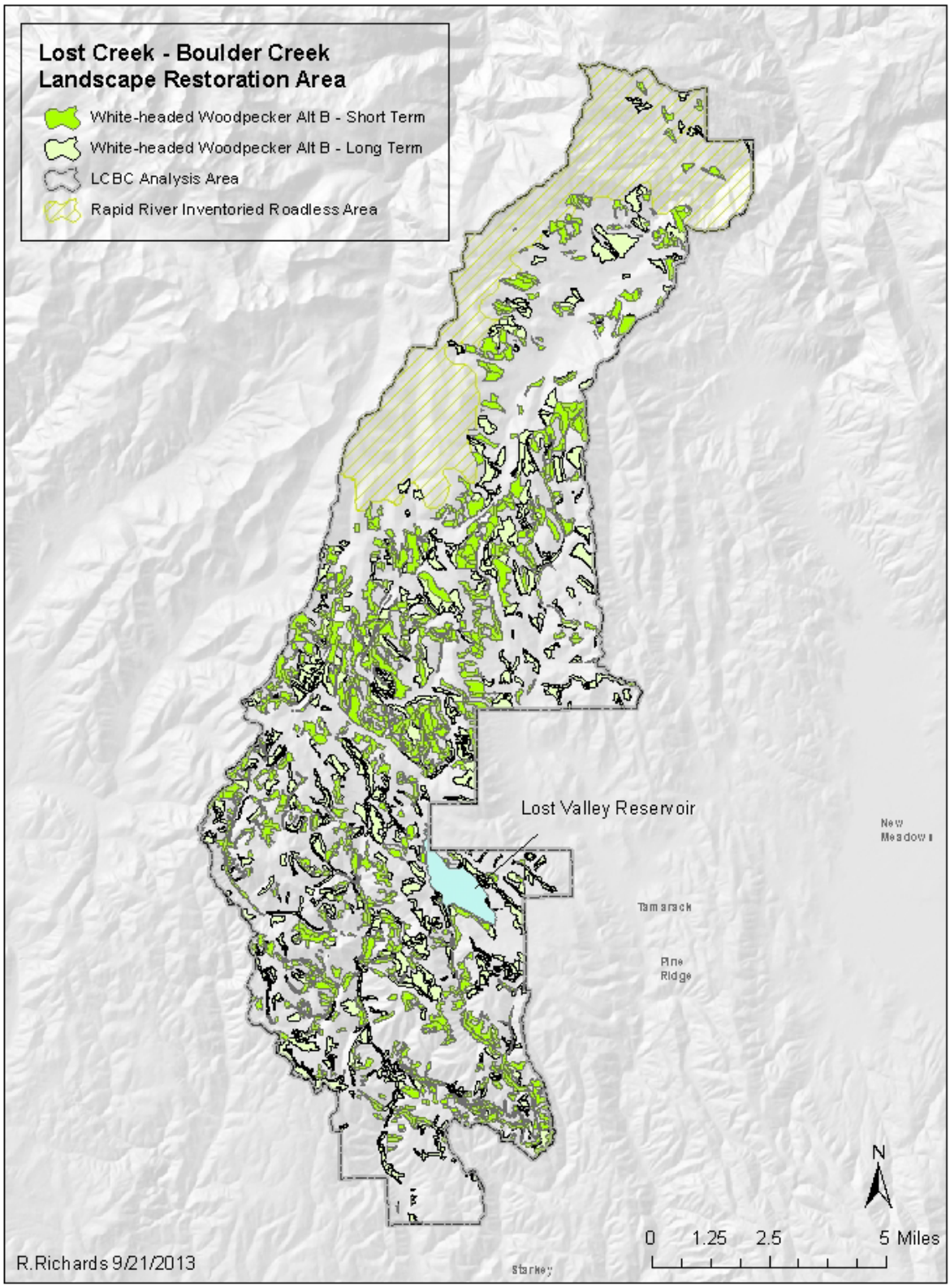


Figure WL-15. White-headed woodpecker modeled source habitat under Alternative B, short and long term

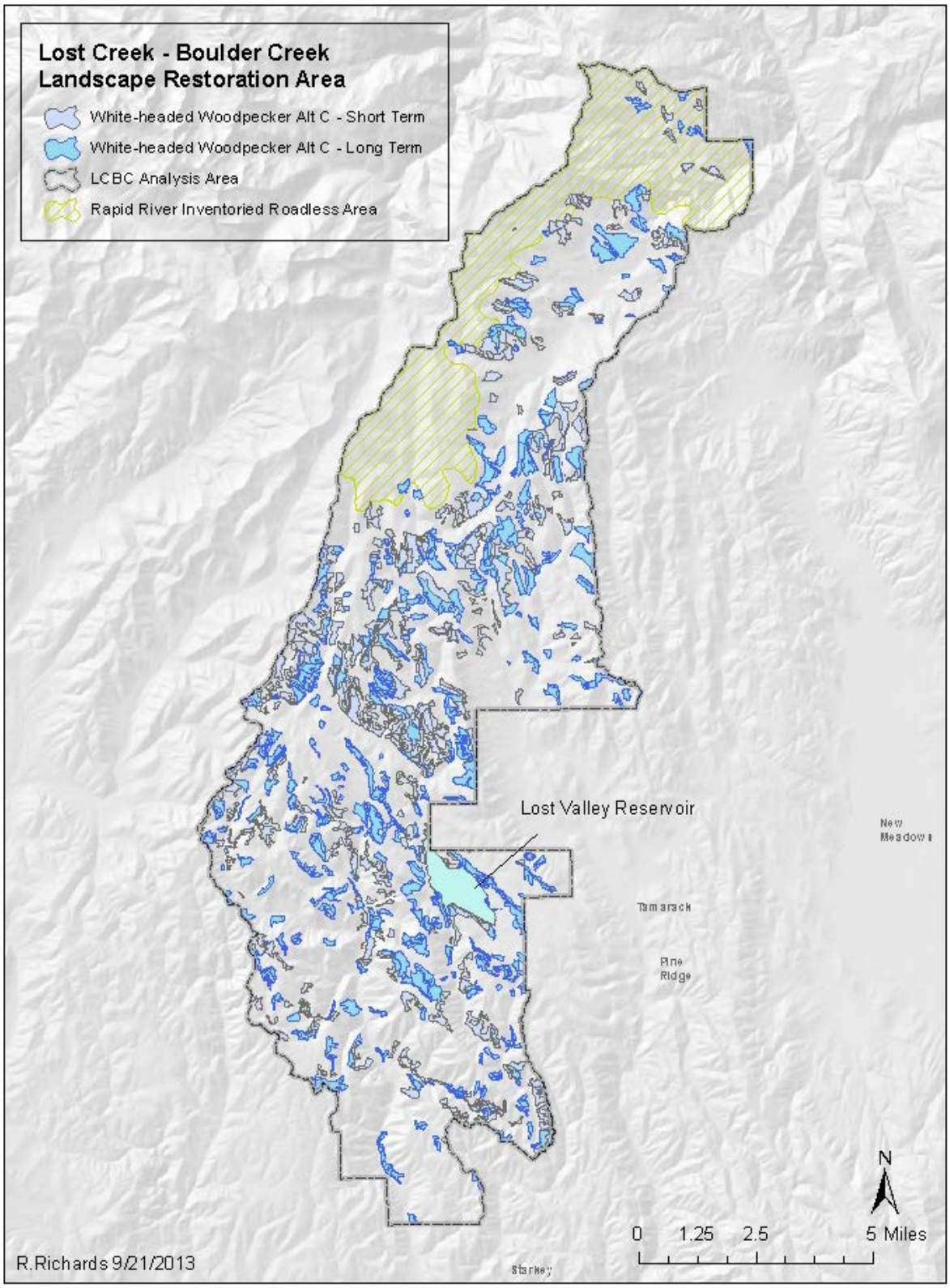


Figure WL-16. White-headed woodpecker modeled source habitat under Alternative C, short and long term

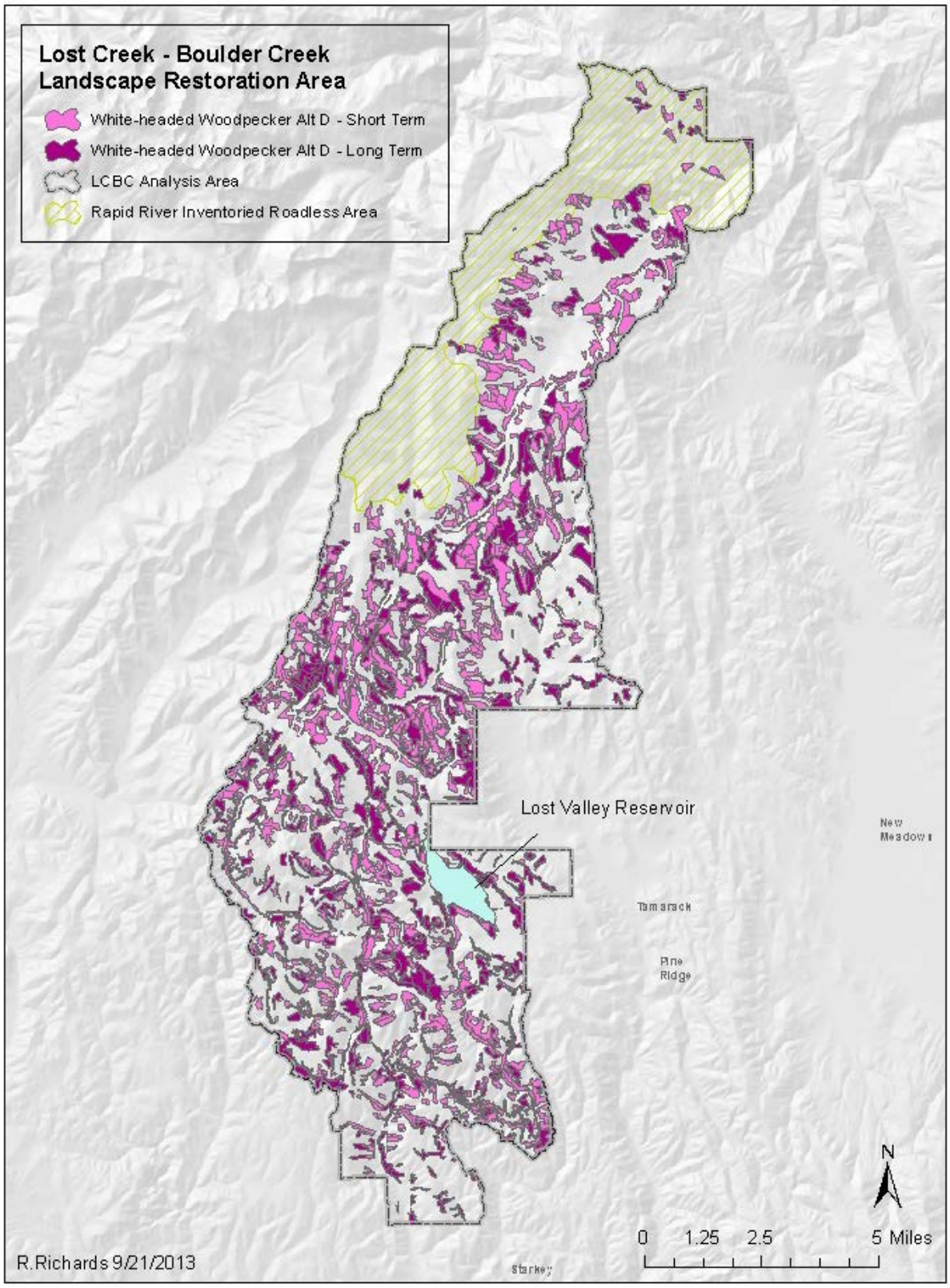


Figure WL-17. White-headed woodpecker modeled source habitat under Alternative D, short and long term

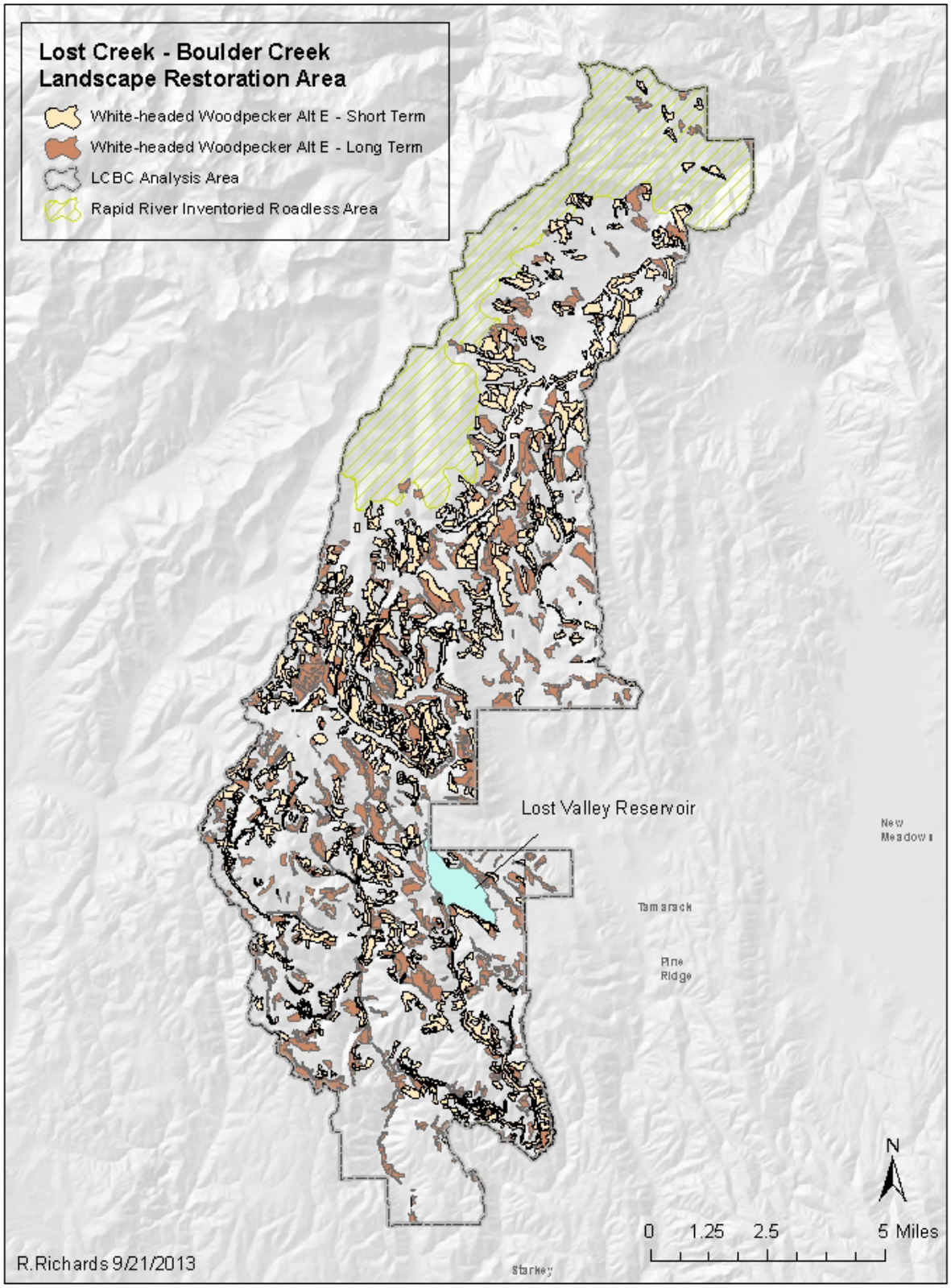


Figure WL-18. White-headed woodpecker modeled source habitat under Alternative E, short and long term

Alternative A will have *no impact to the White-headed Woodpecker*. The action alternatives would provide beneficial impacts to the species.

Habitat Family 2—Pileated Woodpecker

Alternative A - No Action

Habitat Family 2 species, as represented by the pileated woodpecker, are associated with large trees and moderate-to-dense canopy closures. Current modeled source habitat, estimated at slightly more than 20,412 acres, may provide for approximately 20-44 pileated woodpecker home ranges in the project area (Figure WL-19).

The current and expected conditions under the No Action alternative are beneficial to pileated woodpeckers because this species prefers moderate–to-dense, large-tree habitats with insects and disease conditions. This species will use forests that have moved outside of historical conditions, such as PVGs 2 and 5 when either is found with dense canopy cover. Under natural processes, PVG 2 and 5 forests would be more open, but fire suppression has caused these forest types to grow denser. As shown in Table WL-15 more than 9,000 acres of habitat for the pileated woodpecker are provided in PVGs 2 and 5 forests with moderate and dense canopy closure. Over time, these forests are at greater risk of wildfire and associated loss of pileated woodpecker habitat.

Effects Common to All Action Alternatives

Following mechanical thinning and prescribed burning under the action alternatives, pileated woodpecker source habitat would decrease as forests are thinned to restore a more open canopy and increase the percentage of seral, large tree species. Modeled habitat maintained post-harvest would be 13,499 and 11,596 acres under Alternatives B and E, respectively and about 18,309 acres under Alternative C. Under Alternative D approximately 10,322 acres is maintained in the moderate or high canopy class (Table WL-15, Figures WL-20-23). This would equate to retainment of 11-13 home ranges under Alternative E and B, and 10-18 under D and C. It is important to remember that the true impacts of these changes in habitat may be far less if the distribution of the treatments retains sufficient source habitat in a home range. It is unknown what amount that would be, so the modeled “worst case,” is presented here. In a worst case scenario (home range size = 1,006 acres), a minimum of ten modeled home ranges would remain under each Action alternative. Because Alternative C proposes to treat the least amount of existing habitat, this Alternative would retain a maximum of 18 home ranges. At the same time, open canopy, large-tree habitats would be restored for white-headed woodpeckers and other Family 1 species.

Under all action alternatives, even if restoration treatments are maintained in the future (likely through continued prescribed burning), the local pileated woodpecker population would still be expected to increase over time as many medium-age stands grow into large-tree stands with moderate-to-dense canopies. Hence under all the action alternatives, reductions in source habitat for pileated woodpeckers and other Family 2 species would likely be short term. Long term, Family 2 habitat could be lost if stands that did not receive treatments were reduced by an uncharacteristic wildfire.

Effects to patch and pattern of source habitat for white-headed woodpeckers and pileated woodpeckers can be seen by looking at the associated source habitat maps for each species. Note in Figure WL-19, the larger size, tighter distribution, and connectivity of habitat polygons for pileated woodpeckers, as compared to the patchiness and small size of the white-headed woodpeckers source habitat in Figure WL-14. In Figures

WL-20 to 23, even with the reduction in habitat polygon numbers and size, the distribution and connectivity of pileated woodpecker habitat polygons is generally maintained.

Cumulative Effects

Ongoing and/or foreseeable future activities that could add to impacts within the analysis area are summarized in the DEIS. Actions on NFS lands that may cumulatively impact this species include ongoing fuelwood removal. Currently, private and State lands open to timber harvest are expected to have low levels of large-tree, mixed-conifer forests; old-forest conditions; and snags. Future actions on these lands are expected to further reduce these important habitat components. All action alternatives would decrease pileated woodpecker habitat in the project area in the short term. While these losses are likely to be cumulative, with other negative effects to pileated woodpecker habitat across the cumulative effects area, they are expected to be relatively short term and minor (more than ten pileated woodpecker home ranges are expected to be maintained). In addition, the losses in pileated woodpecker source habitat result in corresponding increases in habitat for white-headed woodpeckers and Family 1 - a species and Family at greater risk. Alternative C decommissions more unauthorized routes than any other alternative, resulting in the greatest cumulative offset for other actions in the project area. These road closures would benefit all Family 2 species, by decreasing human access into source habitats, whether or not adjacent stands received treatment.

Determinations

An effects determination is not required for this MIS species.

Table WL-15. Acres of pileated woodpecker source habitat, by Potential Vegetation Group (PVG), for all alternatives

Alternative A							
Tree Size/Canopy Cover Class	**PVG 2**	**PVG 3**	**PVG 5**	**PVG 6**	**PVG 8**	**PVG 9**	**Totals**
Large/Moderate	2,436	0	3,423	5,358	374	352	11,943
Large/High	713	0	2,622	4,751	162	221	8,469
Totals	3,149	0	6,045	10,109	536	573	20,412
Alternatives B							
Large/Moderate	913	0	2,974	3,988	374	352	8,601
Large/High	444	0	995	3,076	162	221	4,898
Totals	1,357	0	3,969	7,064	536	573	13,499
Alternative C							
	PVG 2	**PVG 3**	**PVG 5**	**PVG 6**	**PVG 8**	**PVG 9**	**Totals**
Large/Moderate	946	0	4,164	5,371	374	352	11,207
Large/High	606	0	1,586	4,527	162	221	7,102
Totals	1,552	0	5,750	9,898	536	573	18,309
Alternative D							
	PVG 2	**PVG 3**	**PVG 5**	**PVG 6**	**PVG 8**	**PVG 9**	**Totals**
Large/Moderate	932	0	1,890	2,628	374	352	6,176
Large/High	385	0	995	2,383	162	221	4,146
Totals	1,317	0	2,885	5,011	536	573	10,322
Alternative E							
	PVG 2	**PVG 3**	**PVG 5**	**PVG 6**	**PVG 8**	**PVG 9**	**Totals**
Large/Moderate	1,015	0	1,966	2,756	374	352	6,463
Large/High	526	0	1,027	3,197	162	221	5,133
Totals	1,541	0	2,993	5,953	536	573	11,596

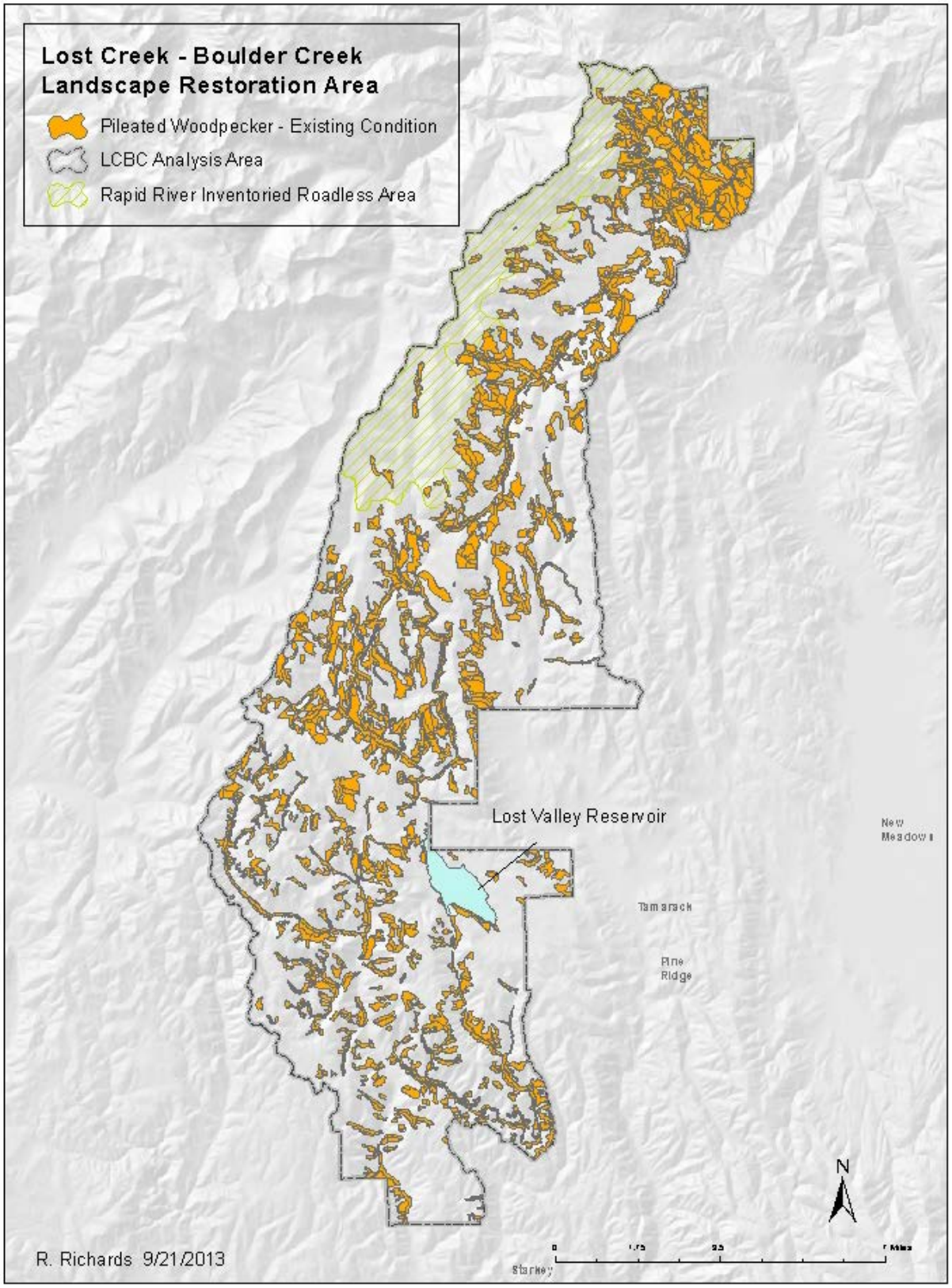


Figure WL-19. Pileated woodpecker modeled source habitat at current condition (Alternative A)

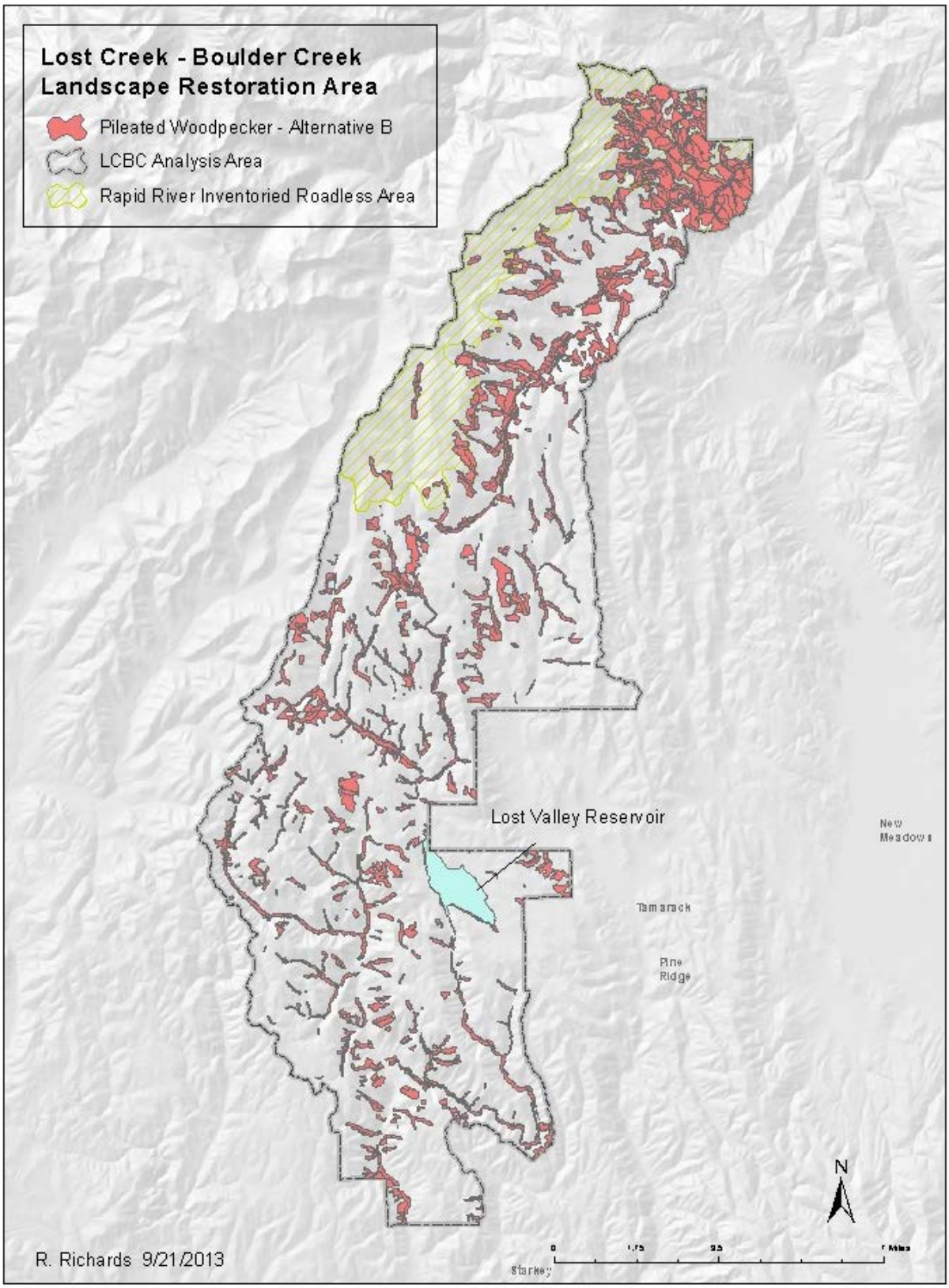


Figure WL-20. Pileated woodpecker modeled source habitat under Alternative B

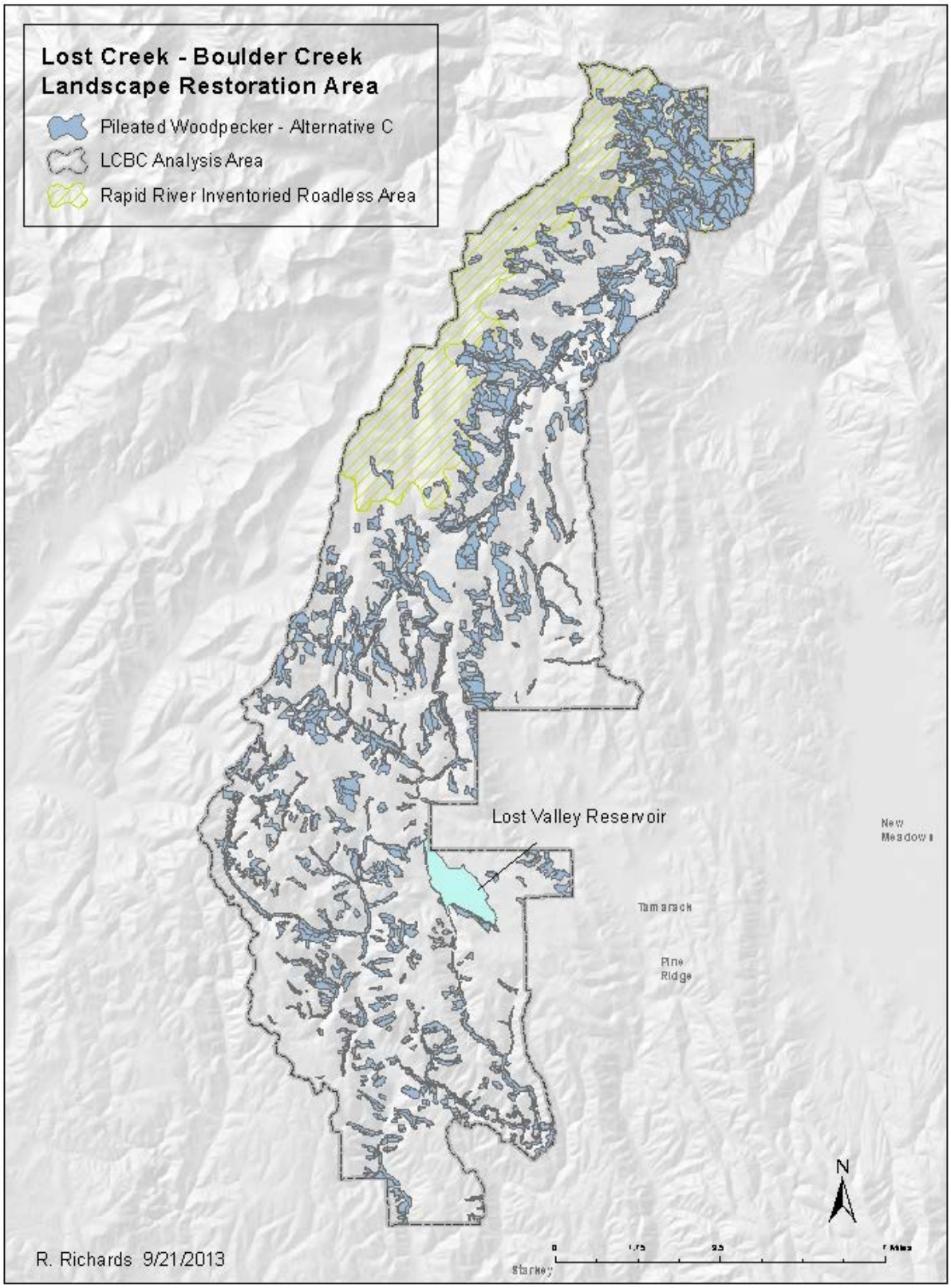


Figure WL-21. Pileated woodpecker modeled source habitat under Alternative C

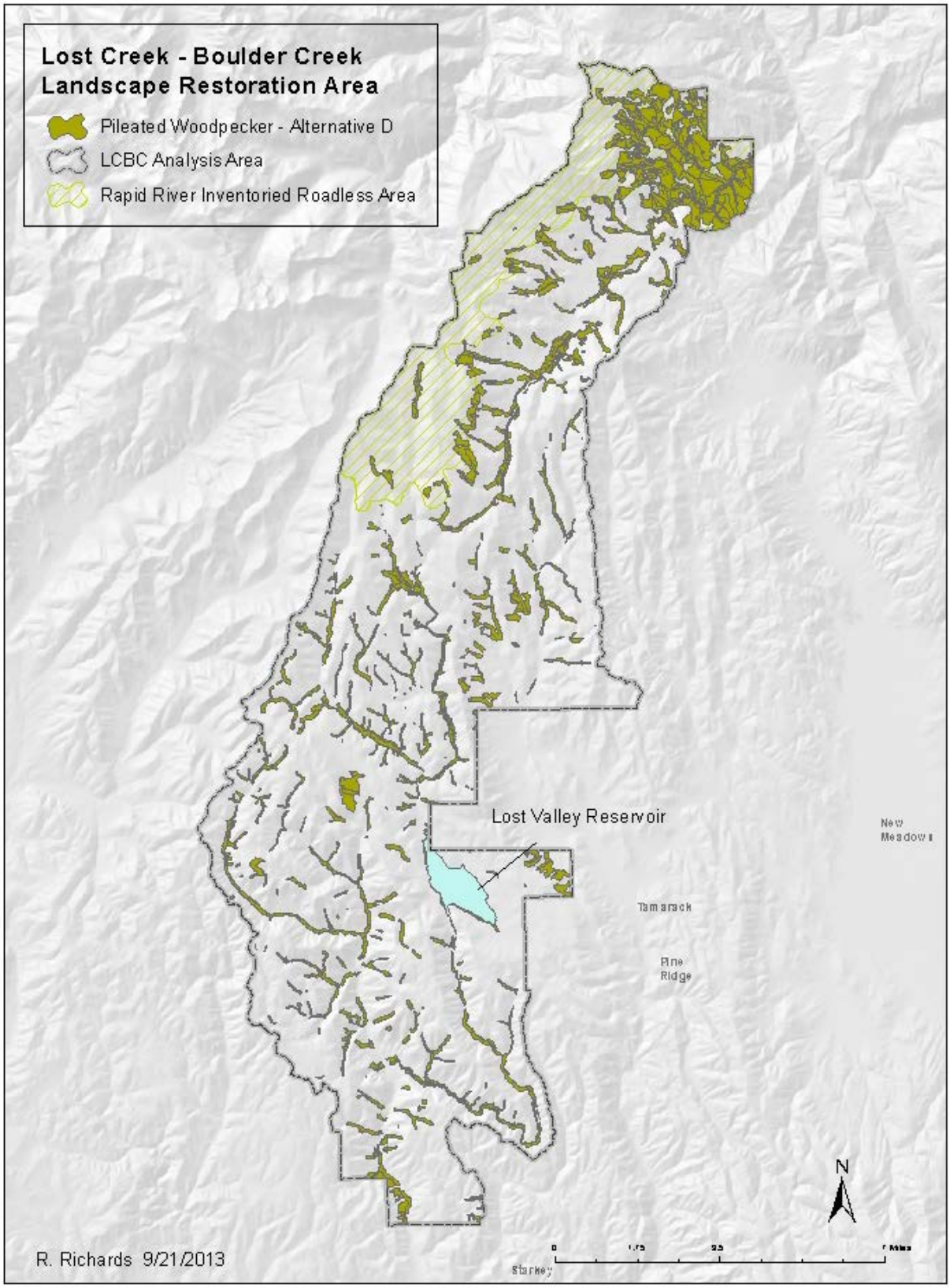


Figure WL-22. Pileated woodpecker modeled source habitat under Alternative D

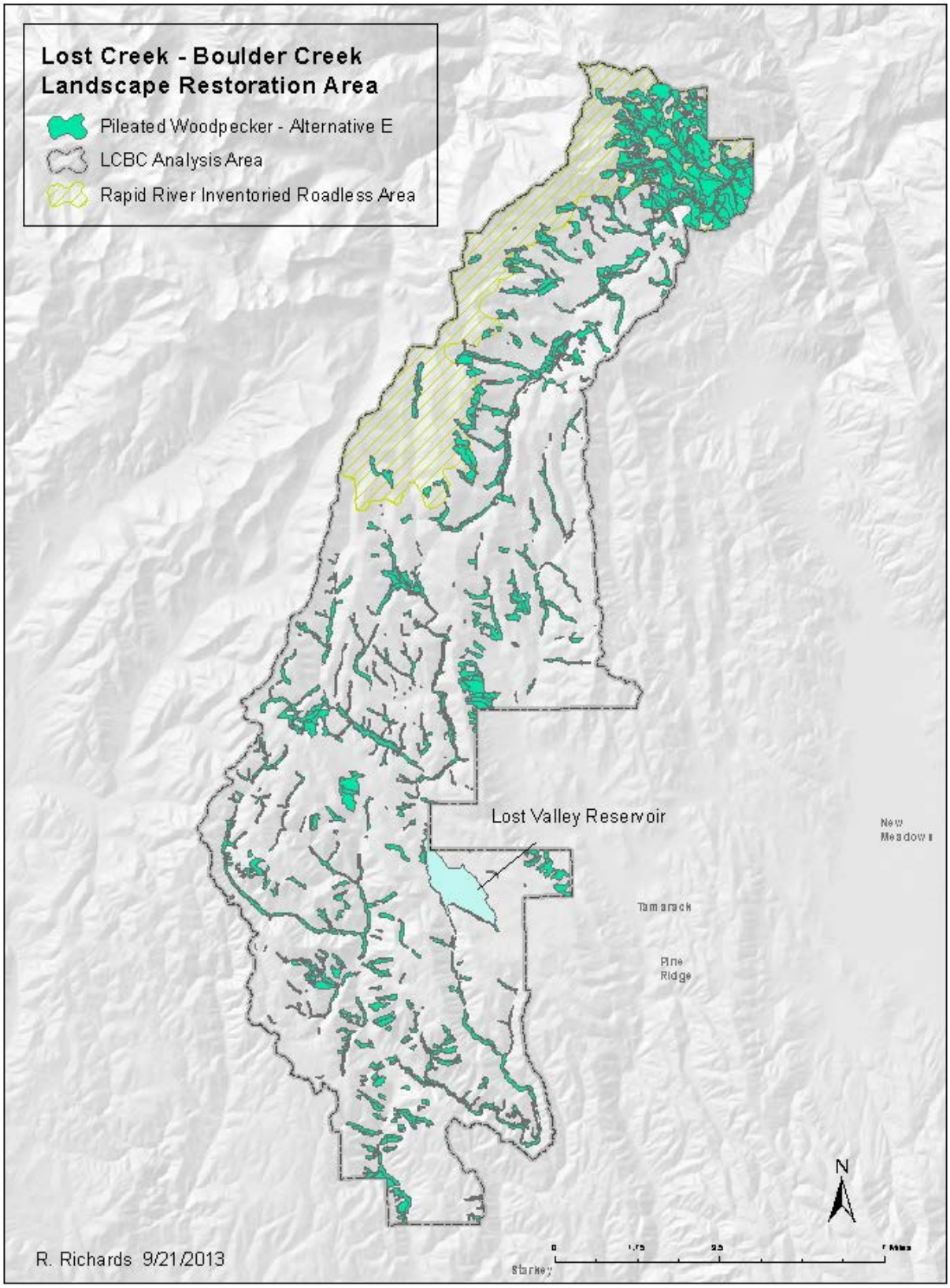


Figure WL-23. Pileated woodpecker modeled source habitat under Alternative E

Habitat Family 2—Flammulated Owl

Alternative A - No Action

Although the general condition of Habitat Family 2 stands is considered good (as portrayed by habitat for the pileated woodpecker), the modeled flammulated owl habitat requirements are more restricted than some other Family 2 species, which results in greater modeled changes to this species' habitat under all alternatives. The flammulated owl model uses PVGs 2, 3, 5, and 6 in the medium and large tree size classes and moderate canopy closure class.

About 23,237 acres of modeled source habitat is currently estimated in the Project Area (Table WL-16, Figure WL-24) that likely supports numerous flammulated owl home ranges. Based on a home range size of 31 acres, it can be presumed that a maximum of 750 home ranges could be present, which is likely an overestimate.

Although surveys have not been accomplished project area wide, in June of 2013 a total of 14 owls were detected over 4 nights of calling on 4 different transects, consisting of 46 calling stations. Two of the transects, involving 26 calling stations, were in the Butter Gulch area and yielded 13 of the owl responses. On two occasions 2 owls responded at one calling station. The transect in the Lost Creek drainage, 6 calling stations, produced no responses and the one near Price Valley, 14 calling stations, netted one response. The Price Valley transect was not in modeled habitat, but there was a historical record of a flammulated owl nest in the area.

Under the No Action alternative, some flammulated owl source habitat is expected to be lost as stands enter a high canopy closure class and lose seral species (e.g., large ponderosa pine and Douglas fir).

Effects Common to All Action Alternatives

Since harvest treatments would move the canopy cover class from moderate to low, there is a modeled loss of flammulated source habitat under all action alternatives. Following completion of mechanical thinning and prescribed burning, flammulated owl source habitat would decrease under all action alternatives by approximately 21-51 percent from current conditions (23,237 acres) (Table WL-16, Figures WL-25-28). For example, under the more aggressive Alternatives B, D and E, the source habitat in the medium tree size and moderate canopy stand structure would decrease by an average of 5,716 acres (-52 percent) and stands with large tree and moderate canopy closure structure would decrease by an average of 5,634 acres (-50 percent) from current condition (albeit under different intensities). These large decreases in source habitat are mostly due to the parameters in the flammulated owl source habitat model that include medium and large tree size class stands but only a moderate canopy closure class. Alternative C would retain the most existing source habitat with only about 21 percent of habitat altered collectively in the medium and large tree class with moderate canopy closure. Flammulated owls also use medium- and large-tree stands with low canopy cover, but this canopy cover class was not included in the model because it would overestimate habitat for the species. Still, it is likely that many treated stands that move canopy cover from a moderate to low canopy cover class would provide some flammulated owl habitat, and actual habitat declines would not be as great as modeled habitat declines.

Effects to patch and pattern of source habitat for flammulated owls can be seen by looking at the associated source habitat maps. Note in Figure WL-24, the larger size, tighter distribution, and connectivity of habitat polygons for flammulated owls, as compared to that noted for white-headed woodpeckers. Note in Figures 25-28, that, even with the reduction in habitat polygon numbers and size, the size, distribution, and

connectivity of flammulated owl habitat polygons is generally maintained, as compared to the habitat illustrated in Figure WL-24.

To better understand the actual effects of the restoration treatments, the District wildlife staff will continue monitoring flammulated owls on the transects established in 2013. This monitoring should occur at least one additional year before treatments commence and for three years after treatments are completed. This monitoring would also help to identify nest sites. Project design features require that nest trees be protected and disturbance at active nest sites be restricted.

Under all action alternatives, even if treatments are maintained in the future (likely through continued prescribed burning), the local flammulated owl population would still be expected to increase as tree densities and sizes increase, moving the canopy cover class from low to moderate. Hence under all the action alternatives, source habitat losses for flammulated owls are expected to be mostly short term. Long term, Family 2 habitat could be lost if stands that did not receive treatments were reduced by stand replacing wildfire.

Cumulative Effects

Ongoing and/or foreseeable future activities that could add to impacts within the analysis area are summarized in the DEIS. Actions on NFS lands that may cumulatively impact this species include ongoing fuelwood removal. Private and State lands open to timber harvest are expected to have low levels of large trees, seral species, old forest conditions, and snags, both currently and in the future. Alternative C closes more FS system roads and unauthorized routes than any other alternative, resulting in the greatest cumulative offset for other actions in the project area. All action alternatives would decrease flammulated owl habitat in the project area, but these losses are expected to be short term.

Determinations

Alternative A will have *no impact to the Flammulated Owl*. The action alternatives 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.

Table WL-16. Acres of flammulated owl source habitat, by Potential Vegetation Group (PVG), for all alternatives.

Alternative A						
Tree Size/Canopy Cover Class	**PVG-1**	**PVG-2**	**PVG-3**	**PVG-5**	**PVG-6**	**Totals**
Medium/Moderate	112	3,755	0	1,846	6,160	11,873
Large/Moderate	134	2,436	0	3,432	5,362	11,364
Totals	246	6,191	0	5,278	11,522	23,237
Alternative B						
	PVG-1	**PVG-2**	**PVG-3**	**PVG-5**	**PVG-6**	**Totals**
Medium/Moderate	10	900	0	245	4,690	5,845
Large/Moderate	29	913	0	974	3,988	5,904
Totals	39	1,813	0	1,219	8,678	11,749

Alternative C						
	PVG-1	**PVG-2**	**PVG-3**	**PVG-5**	**PVG-6**	**Totals**
Medium/Moderate	10	1,614	0	595	5,567	7,786
Large/Moderate	75	946	0	4,164	5,371	10,556
Totals	85	2,560	0	4,759	10,938	18,342
Alternative D						
	PVG-1	**PVG-2**	**PVG-3**	**PVG-5**	**PVG-6**	**Totals**
Medium/Moderate	10	898	0	244	4,690	5,842
Large/Moderate	29	932	0	1,890	2,628	5,479
Totals	39	1,830	0	2,134	7,318	11,321
Alternative E						
	PVG-1	**PVG-2**	**PVG-3**	**PVG-5**	**PVG-6**	**Totals**
Medium/Moderate	72	1,356	0	273	5,084	6,785
Large/Moderate	70	1,015	0	1,966	2,756	5,807
Totals	142	2,371	0	2,239	7,840	12,592

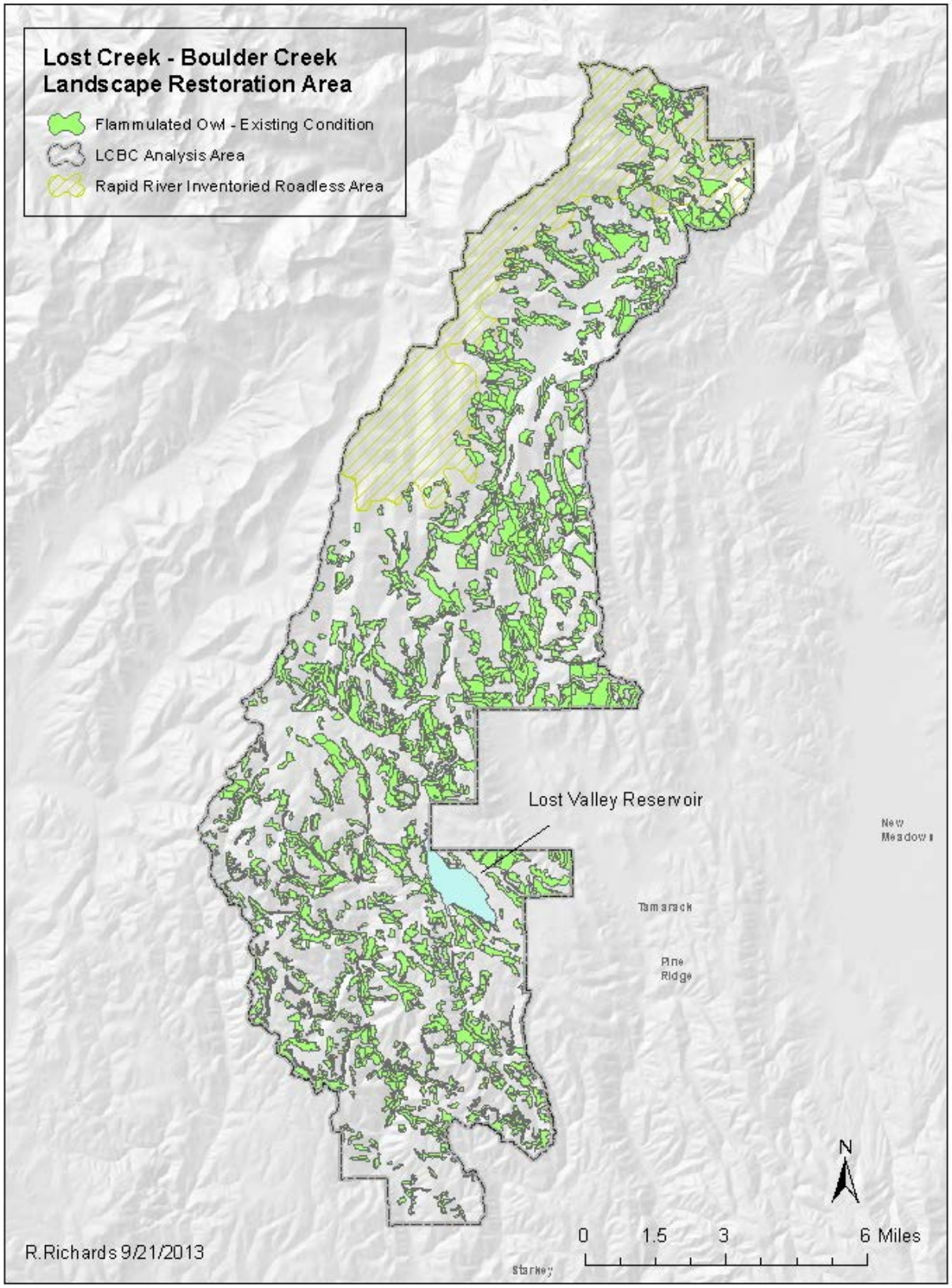


Figure WL-24. Flammulated owl modeled source habitat at current condition (Alternative A)

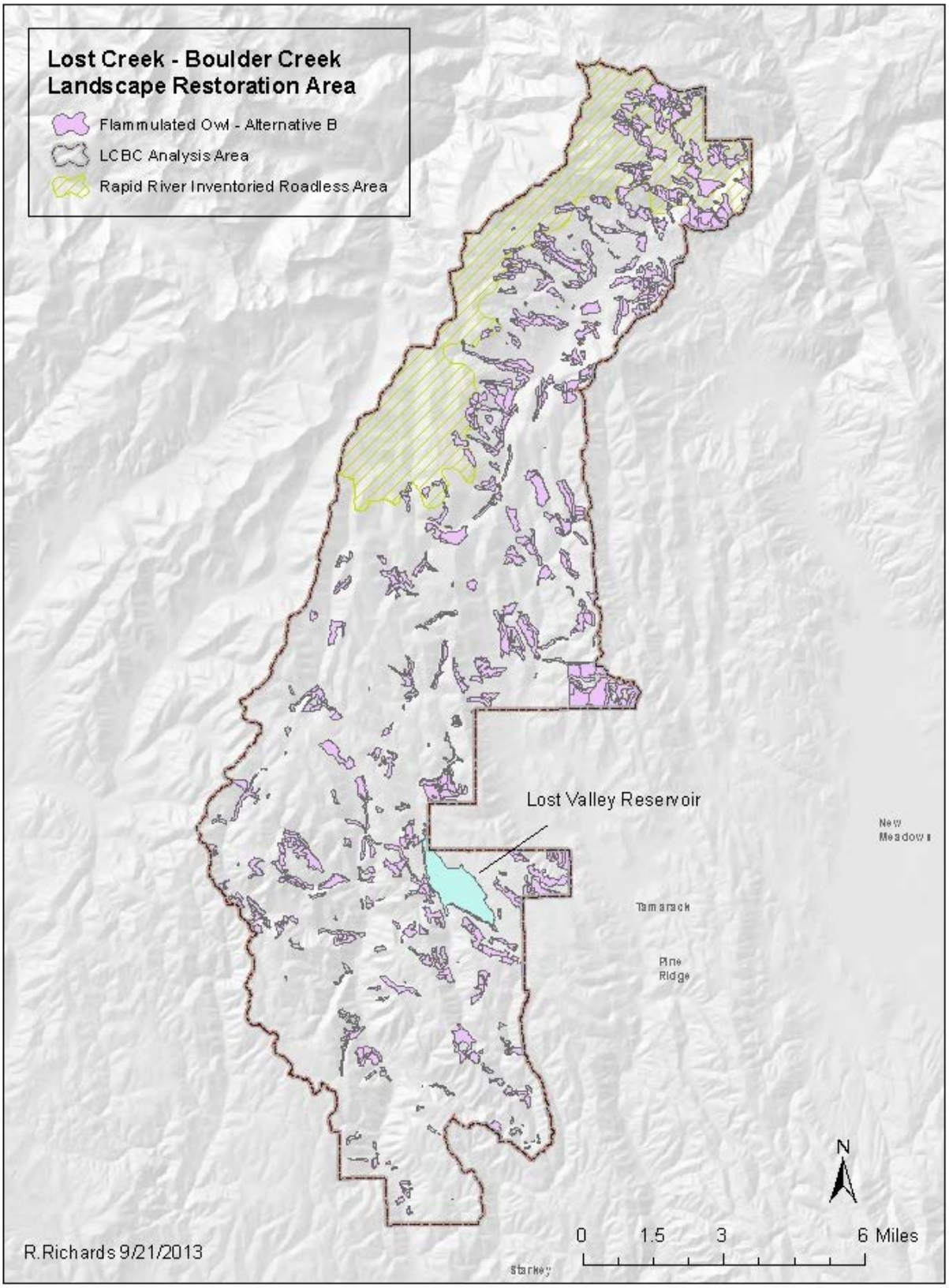


Figure WL-25. Flammulated owl modeled source habitat under Alternative B

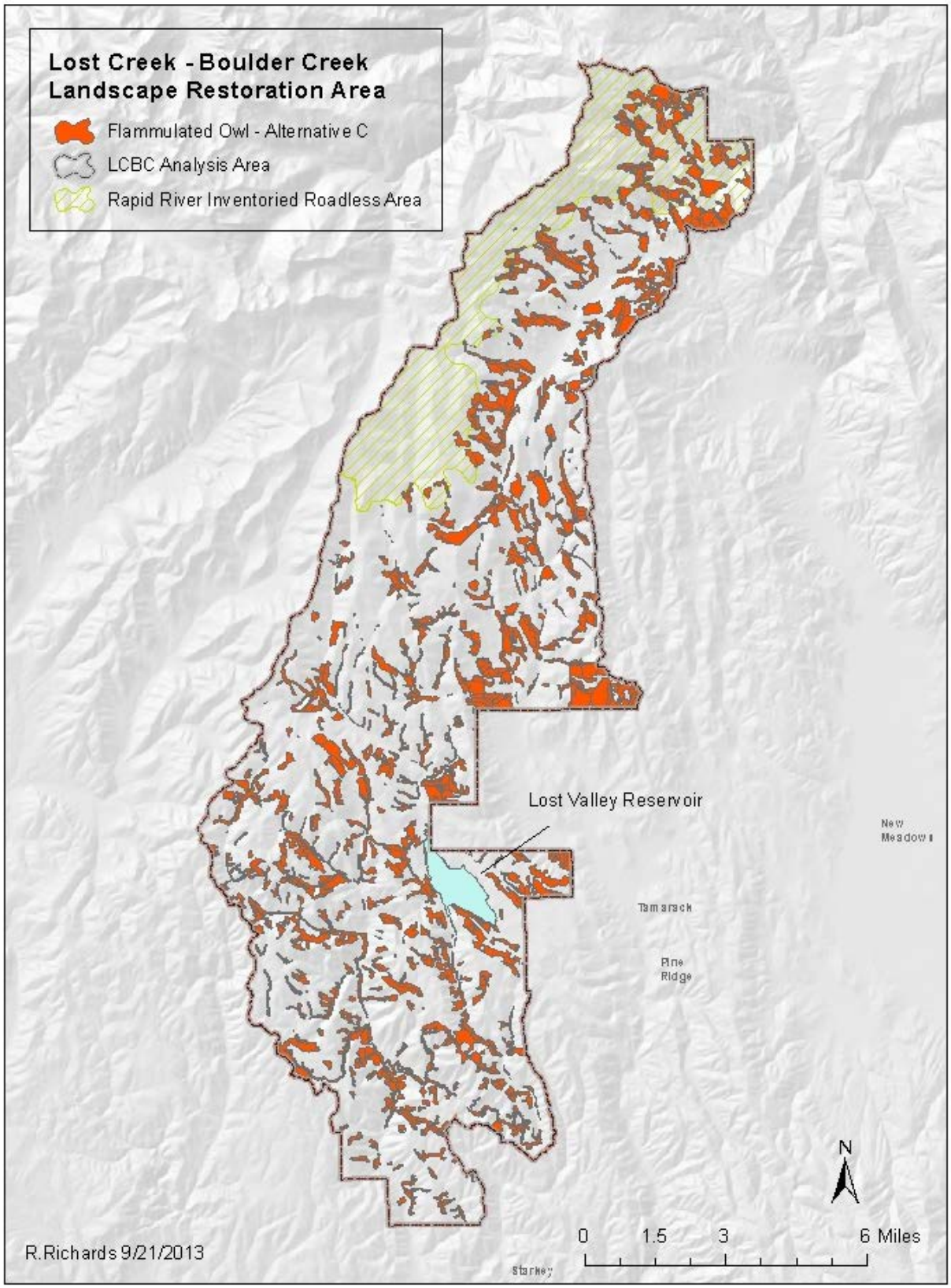


Figure WL-26. Flammulated owl modeled source habitat under Alternative C

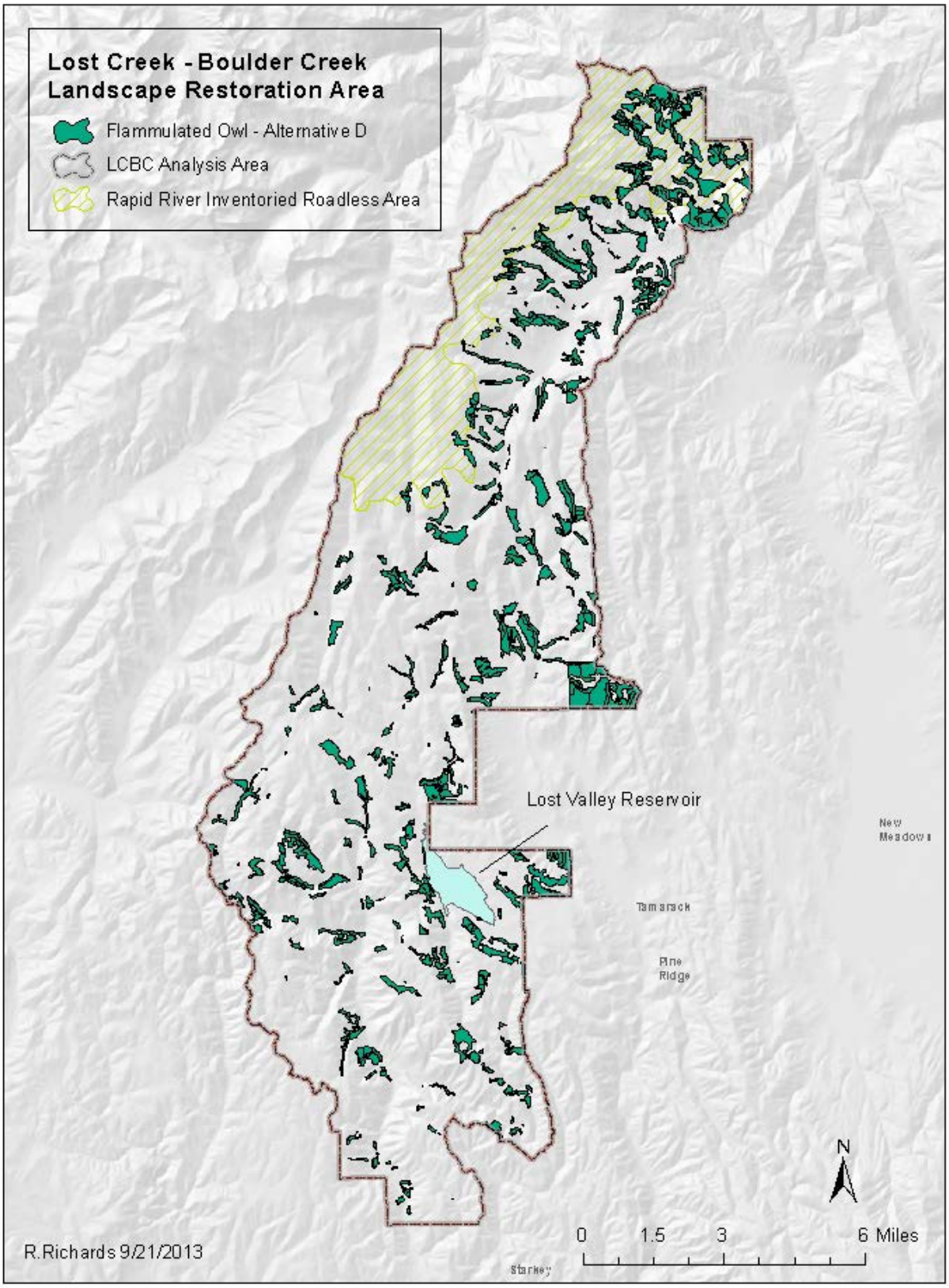


Figure WL-27. Flammulated owl modeled source habitat under Alternative D.

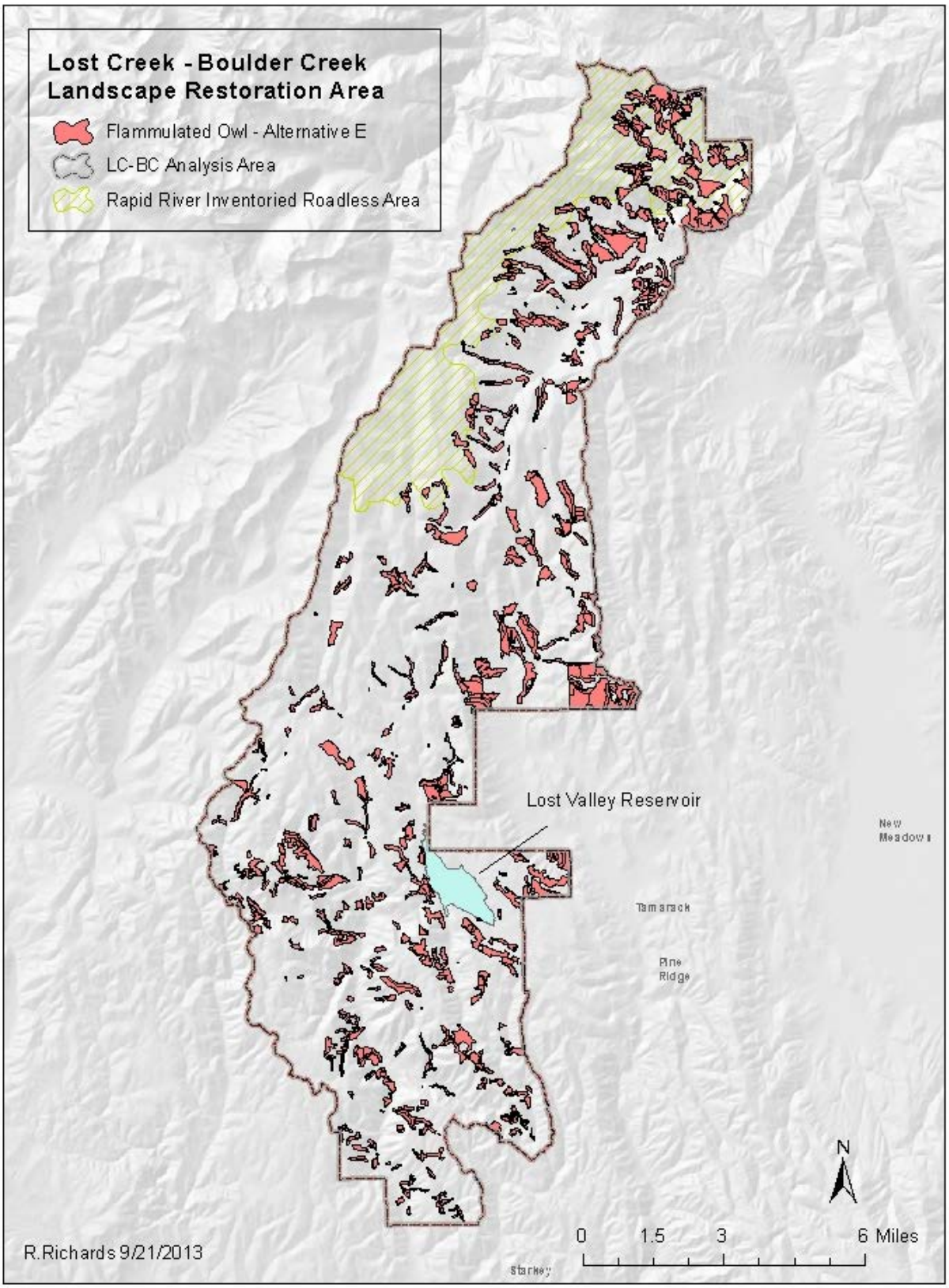


Figure WL-28. Flammulated owl modeled source habitat under Alternative E

Habitat Family 2—Great Gray Owl

Alternative A – No Action

Existing source habitat is estimated at 3,850 acres (Table WL-17, Figure WL-29), which may allow for up to a maximum of one home range based on an average home range size of approximately 5,000 acres (Bull and Henjum 1990). This is likely a close estimation of potential habitat since habitat was modeled within 300 feet of a meadow larger than seven acres. Recent great gray owl surveys indicate the Project Area may support nesting pairs near Lost Valley Reservoir and/or Price Valley.

Total snags were assessed for the PVGs providing source habitat capacity. Existing tree densities would provide for future recruitment of snags with densities increasing over the long term. Although some recruitment and loss of snags would occur over time through natural processes, snags densities in all PVGs would remain similar to the existing conditions. As a result, snag abundance would remain at or above the desired range within all preferred PVGs, providing nesting opportunities for great gray owls.

Alternative A would maintain source habitat and desired conditions for the great gray owl.

Effects Common to All Action Alternatives

Implementing the action alternatives would modify approximately 1,203 - 1,367 acres in Alternative E, and D and no habitat in Alternatives B and C (Table WL-17, Figures WL-30-33). Although some habitat would be treated in Alternatives B and C, it would not be treated in a manner that reduces canopy closure to an undesirable state for this species

The amount of habitat altered is not as important as the location of the habitat alternations. The key to maintaining great gray owls is to conserve habitat for nesting and rearing young adjacent to meadows used for foraging. Availability of nest sites and suitable foraging habitat are considered the most important factors governing habitat use by breeding great gray owls (Collins 1980, Nero 1980, Mikkola 1983). In Eastern Oregon nest trees varied from 23-31 inches DBH. (Bull and Henjum 1990, Bull et al. 1988b). Leaning trees and dense cover are important habitat components, because fledglings leave the nest before being able to fly and leaning trees allow the owlets to climb above the ground, making them less susceptible to predation (Bull et al. 1988). Great gray owls tend to select nest sites in mature or remnant old-growth mixed-conifer forests near openings within 600 feet of openings that have sufficient prey numbers (Platt and Goggans 1992). They will nest in a wide variety of habitat types as long as the required habitat characteristics exist.

Recent surveys have focused on potential harvest units adjacent to meadow habitat in the Lost Valley, Price Valley and Bear Wallow areas. Great gray owls have been observed in the Lost Valley Reservoir /Slaughterhouse and Price Valley areas, but nests have not been documented to date. Great gray owl surveys will continue in the project area each spring to locate and nest stand buffers (areas that have a high likelihood of providing nesting and rearing habitat adjacent to foraging meadows) will be established, if nesting is suspected. Survey protocol will follow direction in Quitana-Coyer et al. (2004). If nesting birds are found in treatment areas or near road networks, a project design feature would ensure nest sites are conserved and disturbance is minimized. These design features are required under all of the action alternatives (see Chapter 2 of EIS).

Cumulative Effects

Ongoing and/or foreseeable future activities that could add to impacts on within the analysis area are summarized in the DEIS. Actions on NFS lands include ongoing fuelwood removal. Currently, private and State lands open to timber harvest are expected to have low levels of source habitat and source habitat components (e.g., snags) for this species. Much of the larger meadow habitats that are used for foraging are outside the project area on private land – especially in the Price Valley area. Future actions on these lands are expected to further reduce habitat and habitat components. All action alternatives would decrease owl habitat in the short term, which would be cumulative with other negative effects to habitat across the cumulative effects area. Long-term great gray owl source habitat on the Forest is expected to increase, thereby cumulatively off-setting losses on non-federal lands. Alternative C treats more FS system roads and unauthorized routes than any other alternative, resulting in the greatest cumulative offset for other actions in the project area.

Determinations

Alternative A will have *no impact to the Great gray owl. The action alternatives 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.*

Table WL-17. Acres of great gray owl source habitat for all alternatives by PVG immediately after harvest.

	Alternative A - No Action						
Tree Size/Canopy Cover Class	**PVG-3**	**PVG-6**	**PVG-7**	**PVG-8**	**PVG-9**	**PVG-11**	**Totals**
Medium/Low	0	0	766	12	12	0	790
Medium/Moderate	0	901	180	18	0	0	1,099
Medium/High	0	0	0	0	6	0	6
Large/Low	0	0	121	0	0	0	121
Large/Moderate	0	614	354	64	28	8	1,068
Large/High	0	550	185	28	3	0	766
Total	0	2,065	1,606	122	49	8	3,850

	Alternative B						
Medium/Low	0	0	766	12	12	0	790
Medium/Moderate	0	901	180	18	0	0	1,099
Medium/High	0	0	0	0	6	0	6
Large/Low	0	0	121	0	0	0	121
Large/Moderate	0	614	354	64	28	8	1,068
Large/High	0	550	185	28	3	0	766
Total	0	2,065	1,606	122	49	8	3,850
Alternative C							
Medium/Low	0	0	766	12	12	0	790
Medium/Moderate	0	901	180	18	0	0	1,099
Medium/High	0	0	0	0	6	0	6
Large/Low	0	0	121	0	0	0	121
Large/Moderate	0	614	354	64	28	8	1,068
Large/High	0	550	185	28	3	0	766
Total	0	2,065	1,606	122	49	8	3,850
Alternative D							
Medium/Low	0	0	752	12	12	0	776
Medium/Moderate	0	501	180	18	0	0	699
Medium/High	0	0	0	0	6	0	6
Large/Low	0	0	121	0	0	0	121
Large/Moderate	0	128	334	64	28	8	562
Large/High	0	103	185	28	3	0	319
Total	0	732	1,572	122	49	8	2,483
Alternative E							
Medium/Low	0	0	766	12	12	0	790
Medium/Moderate	0	508	180	18	0	0	706
Medium/High	0	0	0	0	6	0	6
Large/Low	0	0	121	0	0	0	121
Large/Moderate	0	140	353	64	28	8	593
Large/High	0	215	185	28	3	0	431
Total	0	863	1,605	122	49	8	2,647

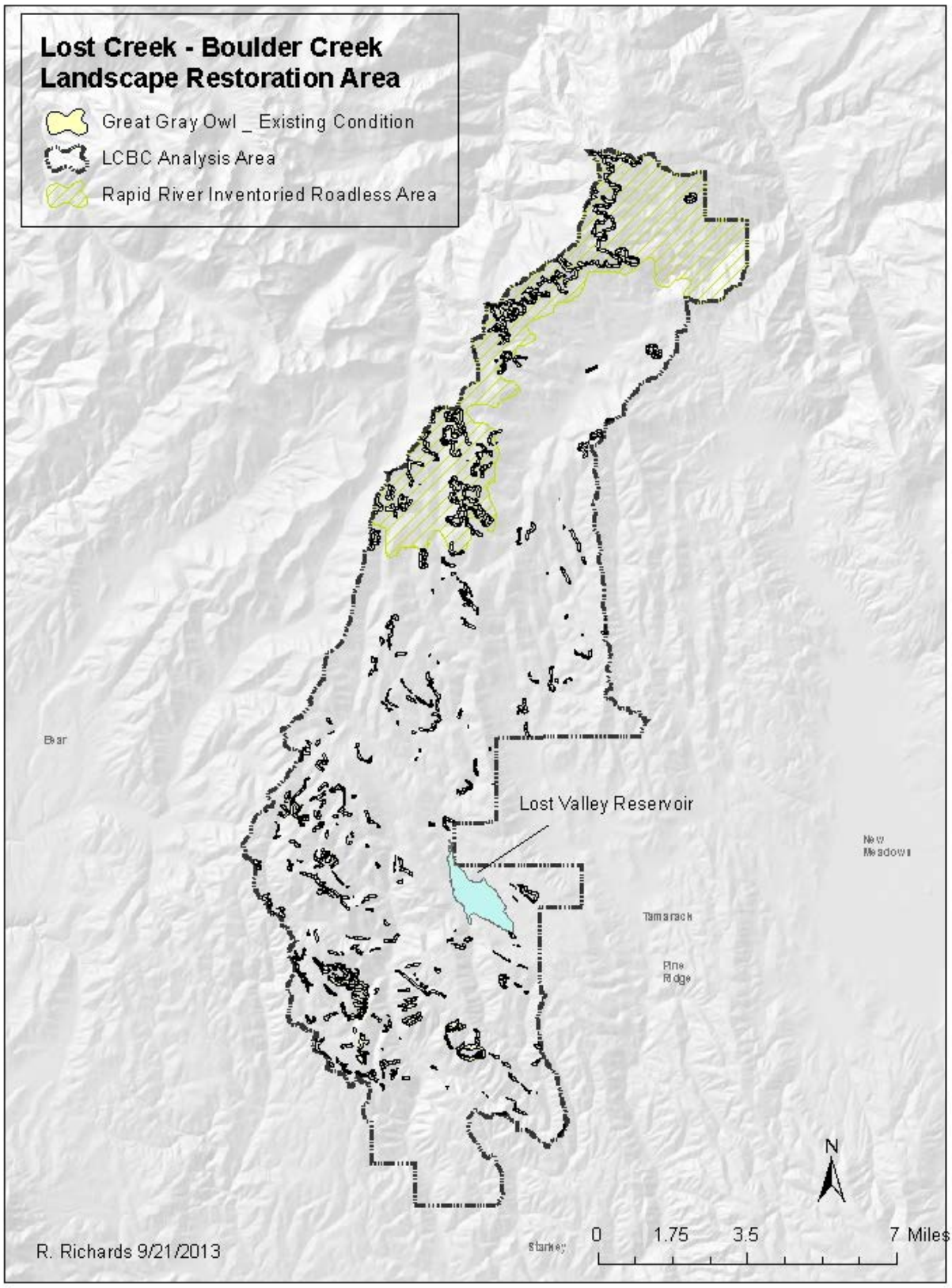


Figure WL-29. Great gray owl modeled source habitat at Current Condition (Alternative A)

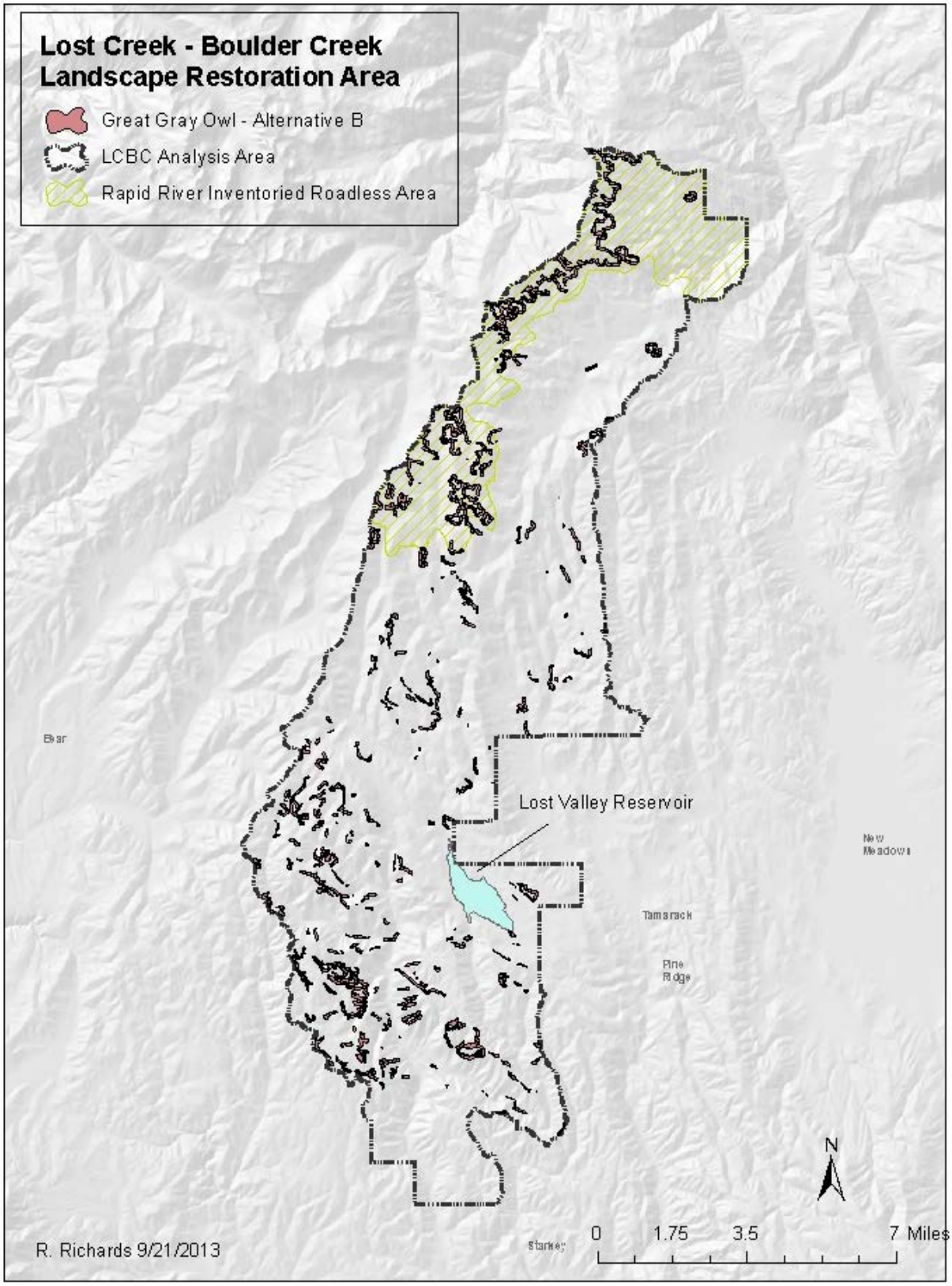


Figure WL-30. Great gray owl modeled source habitat under Alternative B

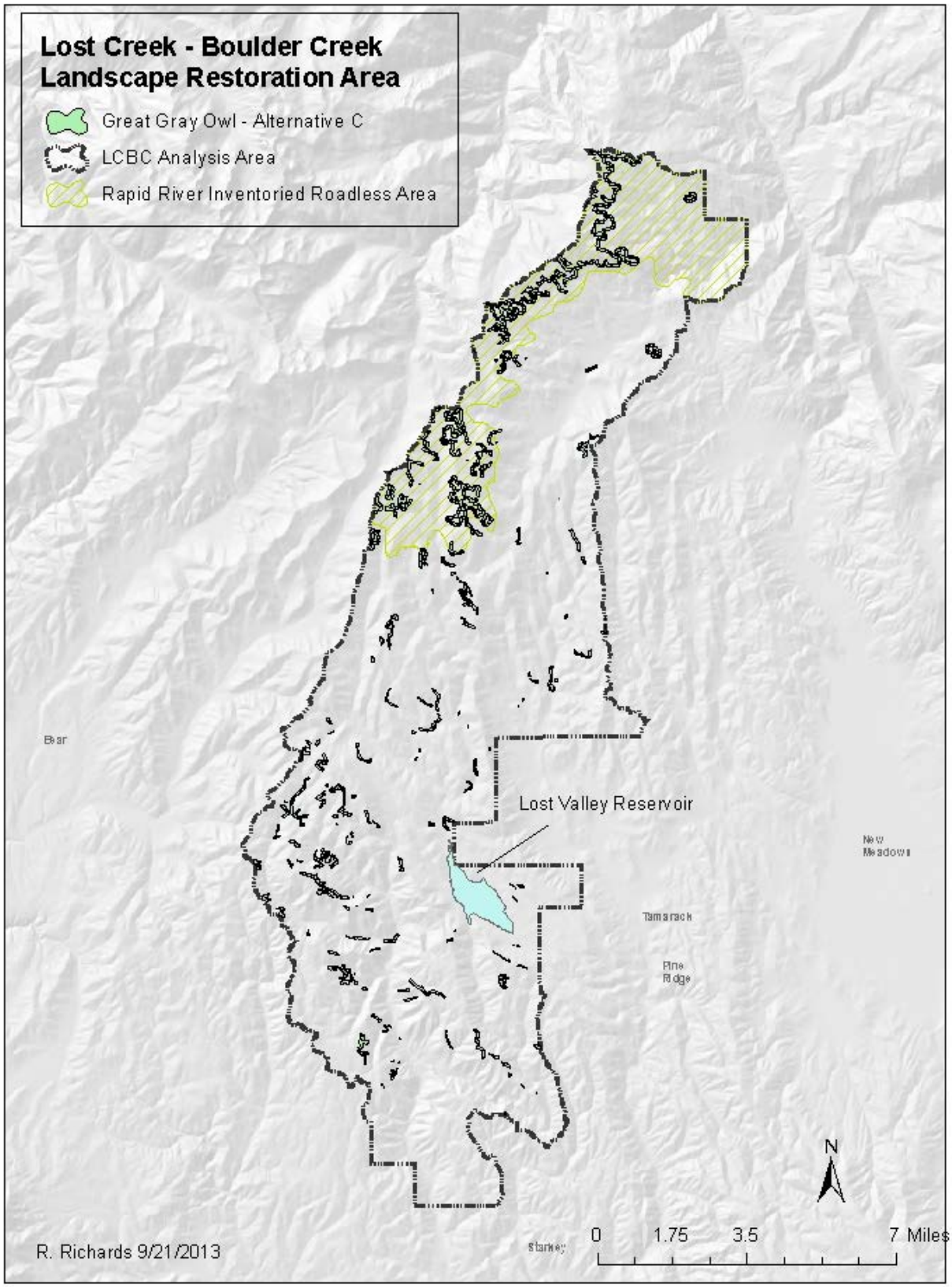


Figure WL-31. Great gray owl modeled source habitat under Alternative C

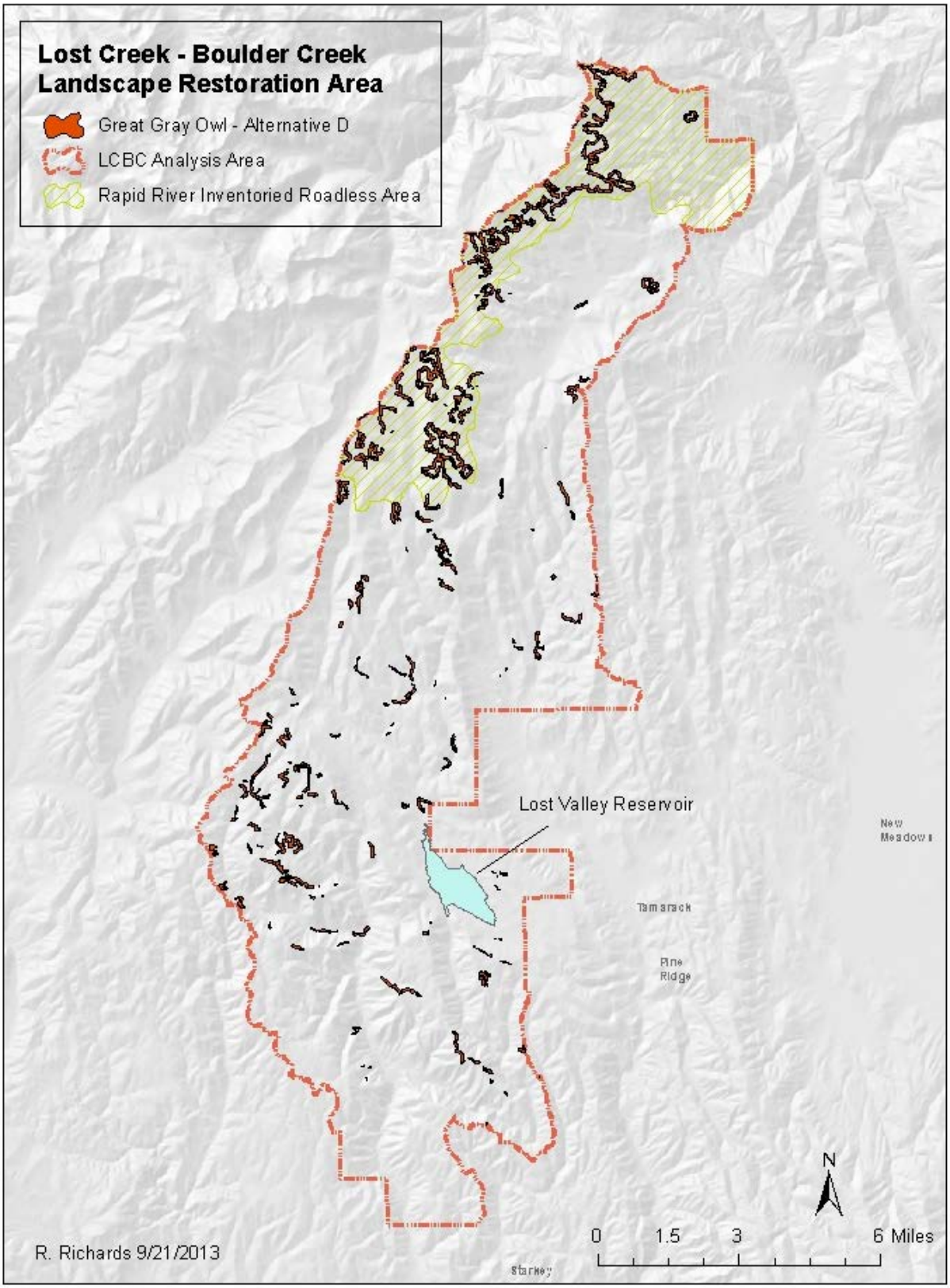


Figure WL-32. Great gray owl modeled source habitat under Alternative D

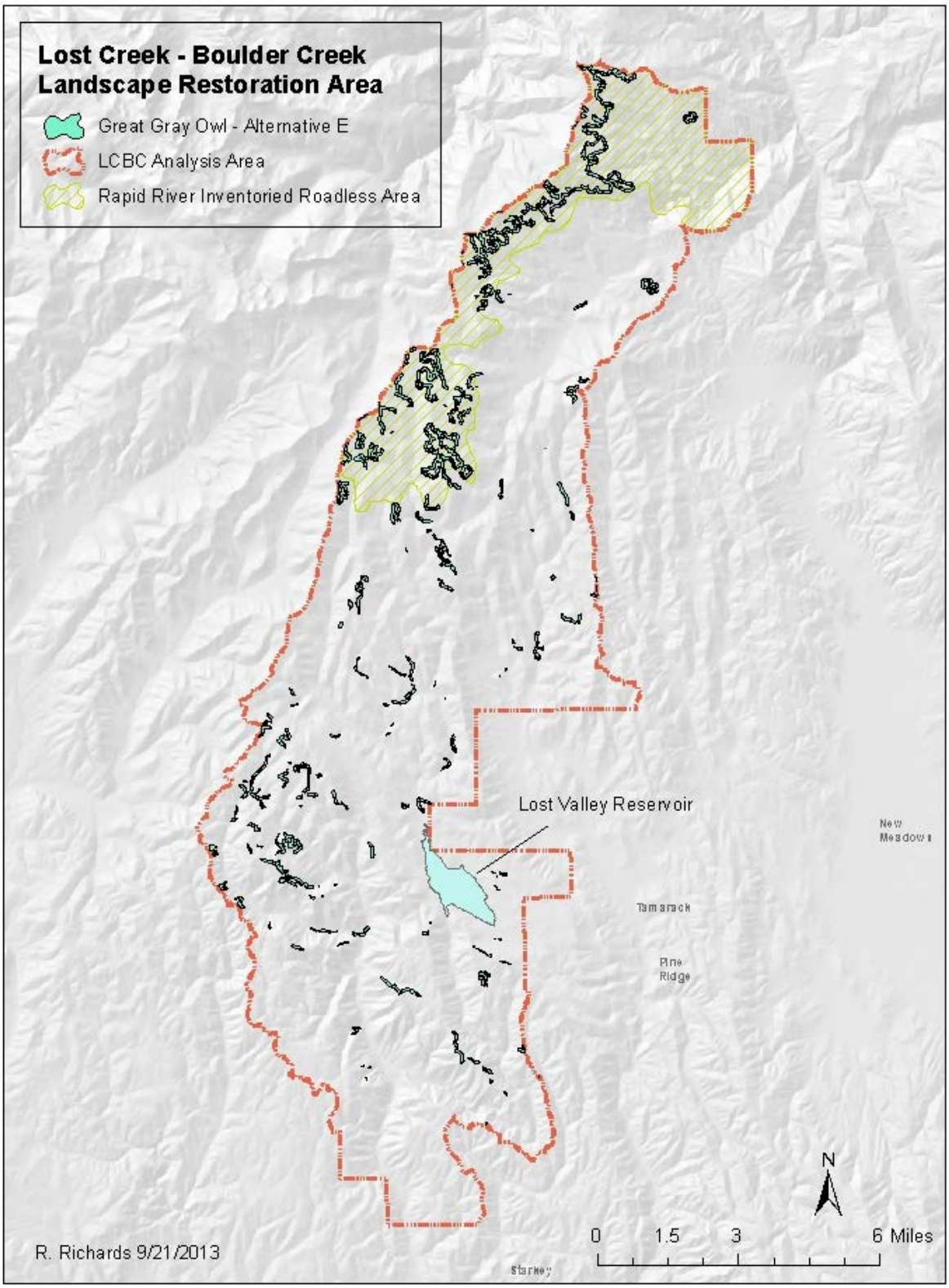


Figure WL-33. Great gray owl modeled source habitat under Alternative E

Habitat Family 2—Northern Goshawk

Alternative A – No Action

At current condition, there is 34,729 acres of northern goshawk (NOGO) source habitat, in medium and large tree size classes and moderate and high canopy closure classes, and in PVGs 2–8, and 9 (Table WL-18, Figure WL-34). This alternative provides the largest amount of source habitat, because none of the project area would be treated under the No Action alternative.

Based on the Conservation Principle indicators (road density, patch characteristics, source habitat abundance, and source habitat quality), Alternative A would result in maintenance of the overall source habitat quantity at current levels. The seven identified PFAs would remain into the future, ensuring a basic level of goshawk habitat quantity and quality, as long as no major habitat disturbance occurred.

Effects Common to All Action Alternatives

Each of the action alternatives reduces existing source habitat. Alternative C is the most conservative with a 13 percent reduction (- 4,446 acres) while Alternatives B, D and E would see 32 percent (- 11,071 acres), 41 percent (-14,263 acres), and 35 percent (- 12,314acres), respectively (Table WL-18, Figure WL-35-38). The size classes of the stands would be maintained, but the canopy closure class would change from high to moderate. A majority of this change is due to treatments in PVGs 5 and 6. The reduction of source habitats in PVG 5 follow closely with expected results from conducting restoration in the drier, lower elevation, ponderosa pine stands. The alteration of such large amounts of PVG 6 stands reduces the availability of many dense-canopy, mixed-species forested stands that typically provide nesting and rearing habitats for goshawks, but design features (described below) ensure that the integrity of the nest stands and associated post-fledgling areas are maintained.

While all action alternatives include decommissioning of FS system roads and unauthorized routes, , Alternative C provides the most of any alternative, which makes Alternative C the most favorable overall alternative for wildlife (Table WL-18, Figure WL-36). Even though Alternative E has a similar amount of habitat alteration as Alternative B, the reduction of unauthorized roads in Alternative B would lead to an overall reduction of human disturbance and may provide better quality goshawk habitat in many sites. All Action Alternatives would follow Forest Plan direction to maintain nest stands and post-fledging areas (PFAs). The seven identified PFA's would remain into the future, ensuring a basic level of goshawk habitat quantity and quality, as long as no major habitat disturbance occurred.

Implementation of Alternative D would result in approximately 20,466 acres of northern goshawk source habitat available immediately following all treatments (Table WL-18, Figure WL-37). Current source habitat would be reduced by approximately 14,263 acres. Compared with the other action alternatives, this alternative would implement the most change to stand densities in the large tree size class of PVGs 5 and 6. The reductions in source habitat are mostly due to treatments in PVGs 2 and 5, with large amounts of PVG 6 left untreated. In addition, the retention of such large amounts of PVG 6 stands continues to provide over 9,931 acres of dense-canopy, mixed-species forested stands that typically provide nesting and rearing habitats for goshawks. The road management proposal for Alternative D also includes up to 69 miles of road decommissioning that were designed to improve watershed function and benefit elk security, but also improve northern goshawk habitat by reducing human disturbance. Alternative D would follow Forest Plan direction to maintain nest stands and post-fledging areas (PFAs). The seven identified PFAs would remain

into the future, ensuring a basic level of goshawk habitat quantity and quality, as long as no major habitat disturbance occurred.

The seven defined PFAs in the project area are deferred from treatment under the action alternatives. In the future, if a PFA needs alteration to create a certain habitat attribute that is lacking, the treatments would be designed to follow the Southwest Guidelines (Reynolds et al. 1992, Youtz et al. 2008) that require a specific mix of tree size/age and canopy closure. The nest stands will be surveyed to determine an appropriate buffer around the nest tree to ensure the structural integrity of the nest site remains intact following the treatments. If nest stand habitat requirements cannot be met under the planned restoration treatments that nest stand will not be treated. As required by both the Southwest Guidelines (Reynolds et al. 1992, Youtz et al. 2008) and the Forest Plan, timing restrictions will be in place for any human access and project activity (generally from March 1 through September 30).

Goshawk surveys over the past decade on the west side of the Forest have found that goshawk family groups have often left the PFA by mid-August (M. Hennon, USDA Forest Service, personal communications 2006-2013). A local management strategy has been adopted that provides for goshawk surveys starting in mid- to late-August to document the presence of goshawks in the area. If the survey indicates no goshawks are present, then some project activities may be allowed within the PFA, with the approval of the Wildlife Biologist, as coordinated with the Sale Administrator and the Silviculturist.

In summary, Alternative C would provide the largest amount of post-treatment goshawk source habitat. The proposed road decommissioning also compliments the retention of source habitat. Alternative A, although representing approximately 4,446 more acres of source habitat than Alternative C, does not meet the draft WCS restoration objectives. Alternative D alters a large amount of habitat, but has almost sixty-nine miles of road decommissioning, somewhat offsetting effects of habitat loss. Alternative B and E alter a similar amount of PVG 6 stands, further reducing source habitat. However, road decommissioning under Alternative B provides eighteen miles more road decommissioning, due to watershed requirements to manage for listed fish and to meet ACR standards.

Cumulative Effects

Ongoing and/or foreseeable future activities that could add to impacts within the analysis area are summarized in the DEIS. Actions on NFS lands include ongoing fuelwood removal. Currently, private and State lands open to timber harvest are expected to have low levels of source habitat and source habitat components (e.g. large diameter trees) for this species. Future actions on these lands are expected to further reduce habitat and habitat components. All action alternatives would decrease habitat in the short term, which would be cumulative with other negative effects to habitat across the cumulative effects area. Long-term northern goshawk habitat on the Forest is expected to increase, thereby cumulatively off-setting losses on non-federal lands. Alternative C closes more unauthorized routes than any other alternative, resulting in the greatest cumulative offset for other actions in the Project Area.

Determinations

Alternative A will have no impact to the Northern Goshawk. The action alternatives 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.

Table WL-18. Acres of Northern Goshawk source habitat for all alternatives, by Potential Vegetation Group (PVG), immediately after harvest

	Alternative A – Existing Condition								
Tree Size/Canopy Cover Class	**PVG 2**	**PVG 3**	**PVG 4**	**PVG 5**	**PVG 6**	**PVG 7**	**PVG 8**	**PVG 9**	**Totals**
Medium/Moderate	3,755	0	0	1,846	6,160	720	96	58	12,635
Medium/High	0	0	0	0	0	15	0	70	85
Large/Moderate	2,436	0	0	3,432	5,362	1,155	374	352	13,111
Large/High	0	0	0	2,622	4,751	1,142	162	221	8,898
Total	6,191	0	0	7,900	16,273	3,032	632	701	34,729
	Alternative B								
Tree Size/Canopy Cover Class	**PVG 2**	**PVG 3**	**PVG 4**	**PVG 5**	**PVG 6**	**PVG 7**	**PVG 8**	**PVG 9**	**Totals**
Medium/Moderate	1,498	0	0	534	4,920	720	96	58	7,826
Medium/High	0	0	0	0	0	15	0	70	85
Large/Moderate	913	0	0	2,974	3,988	1,155	374	352	9,756
Large/High	444	0	0	995	3,027	1,142	162	221	5,991
Total	2,855	0	0	4,503	11,935	3,032	632	701	23,658
	Alternative C								
Medium/Moderate	1,653	0	0	1,429	5,636	720	96	58	9,592
Medium/High	0	0	0	0	0	15	0	70	85
Large/Moderate	946	0	0	4,164	5,371	1,155	374	352	12,362
Large/High	606	0	0	1,586	4,527	1,142	162	221	8,244
Total	3,205	0	0	7,179	15,534	3,032	632	701	30,283
	Alternative D								
Medium/Moderate	1,434	0	0	534	4,920	720	96	58	7,762
Medium/High	0	0	0	0	0	15	0	70	85
Large/Moderate	932	0	0	1,890	2,628	1,155	374	352	7,331
Large/High	385	0	0	995	2,383	1,142	162	221	5,288
Total	2,751	0	0	3,419	9,931	3,032	632	701	20,466
	Alternative E								
Medium/Moderate	1,744	0	0	562	5,257	720	96	58	8,437
Medium/High	0	0	0	0	0	15	0	70	85
Large/Moderate	1,015	0	0	1,966	2,756	1,155	374	352	7618
Large/High	526	0	0	1,027	3,197	1,142	162	221	6,275
Total	3,285	0	0	3,555	11,210	3,032	632	701	22,415

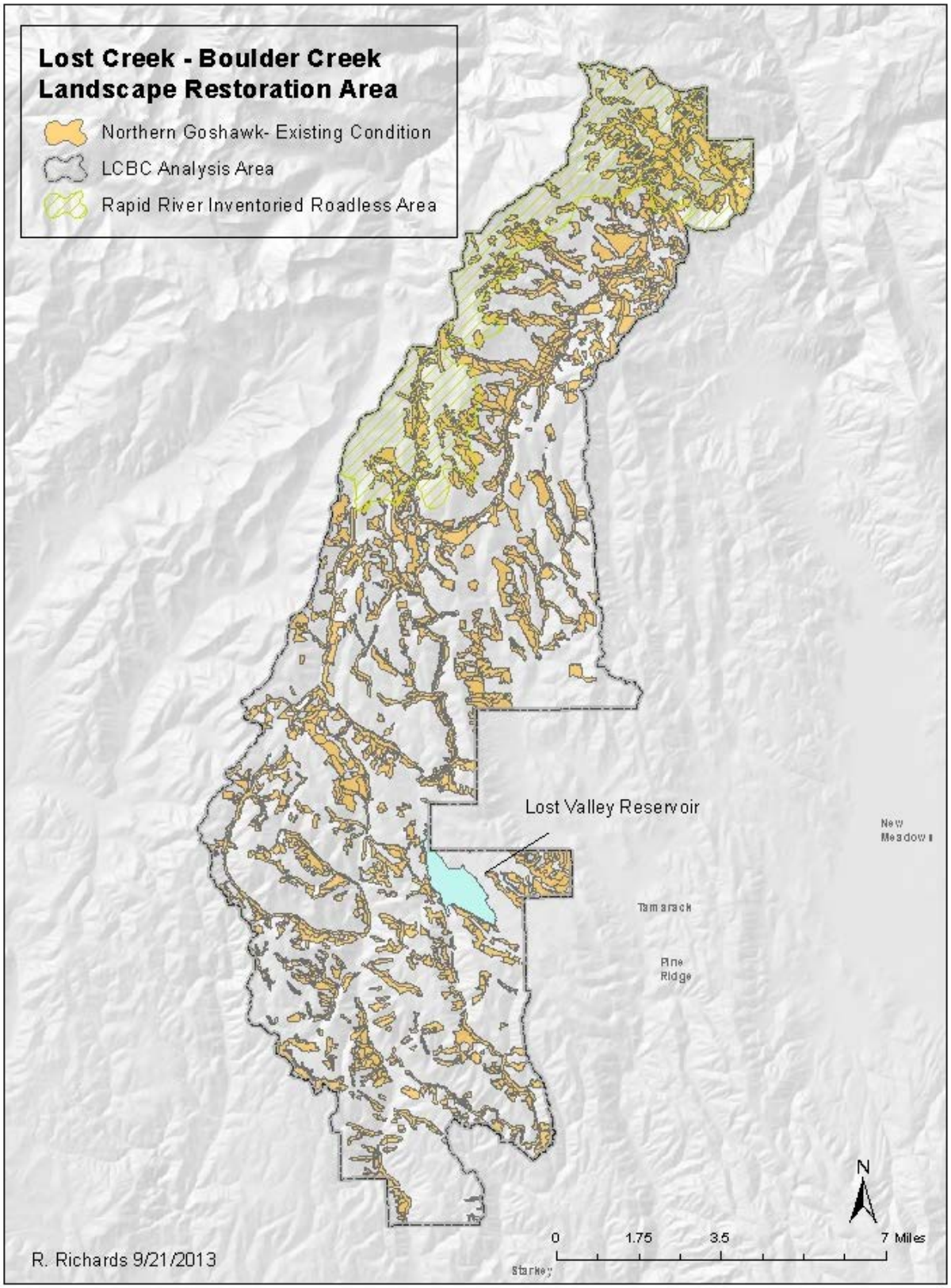


Figure WL-34. Northern goshawk modeled source habitat at current condition (Alternative A)

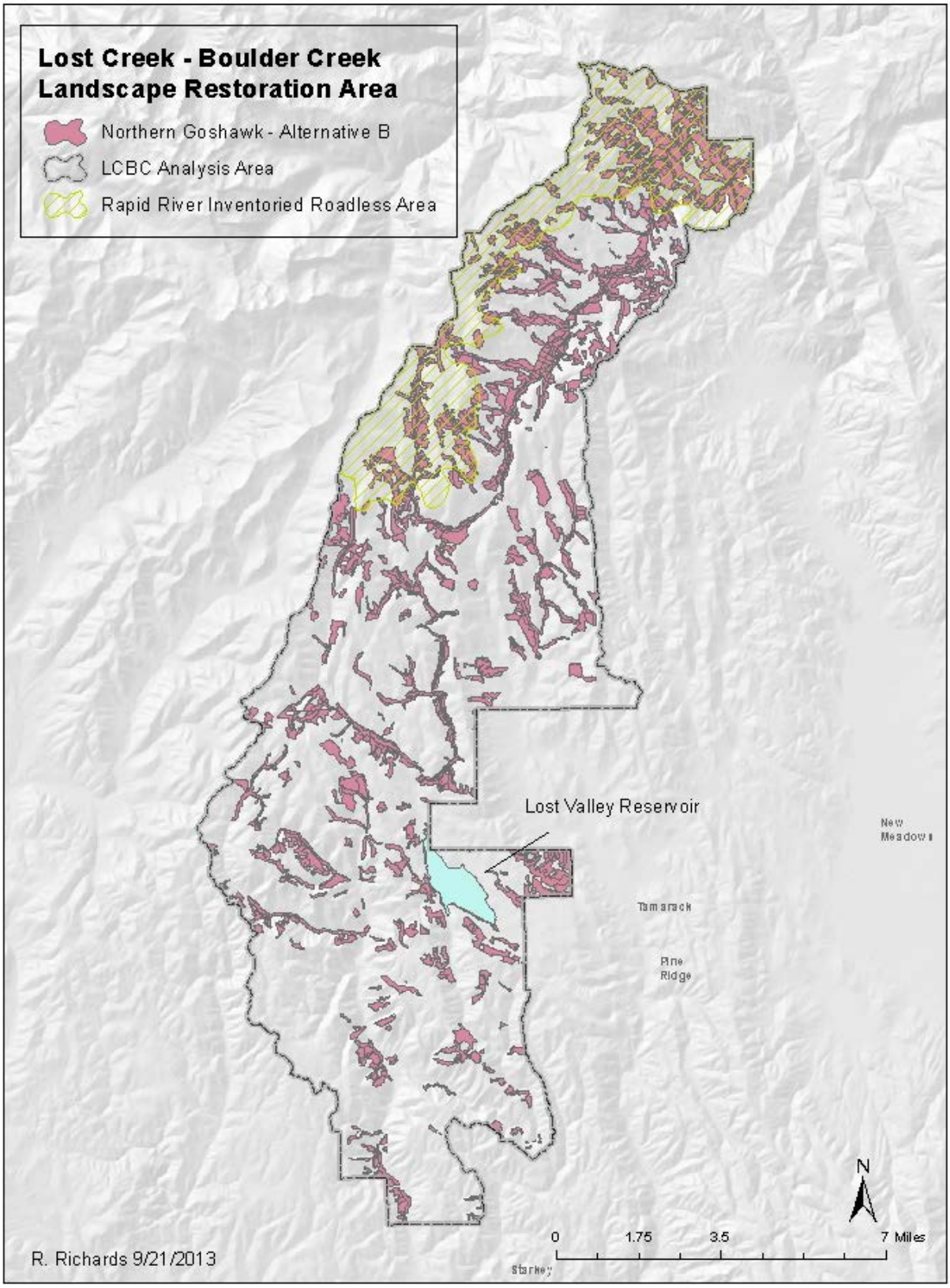


Figure WL-35. Northern goshawk modeled source habitat under Alternative B

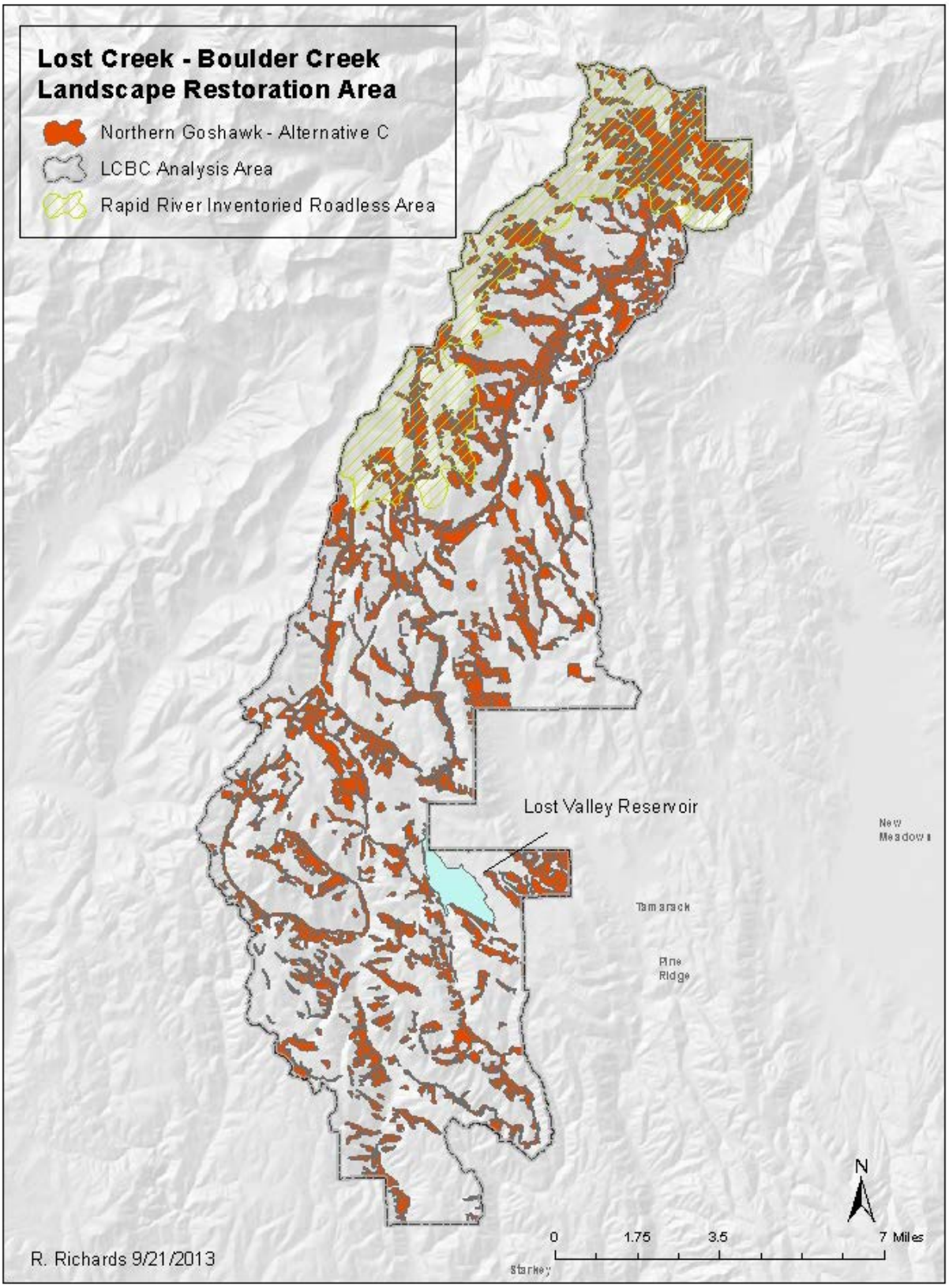


Figure WL-36. Northern goshawk modeled source habitat under Alternative C

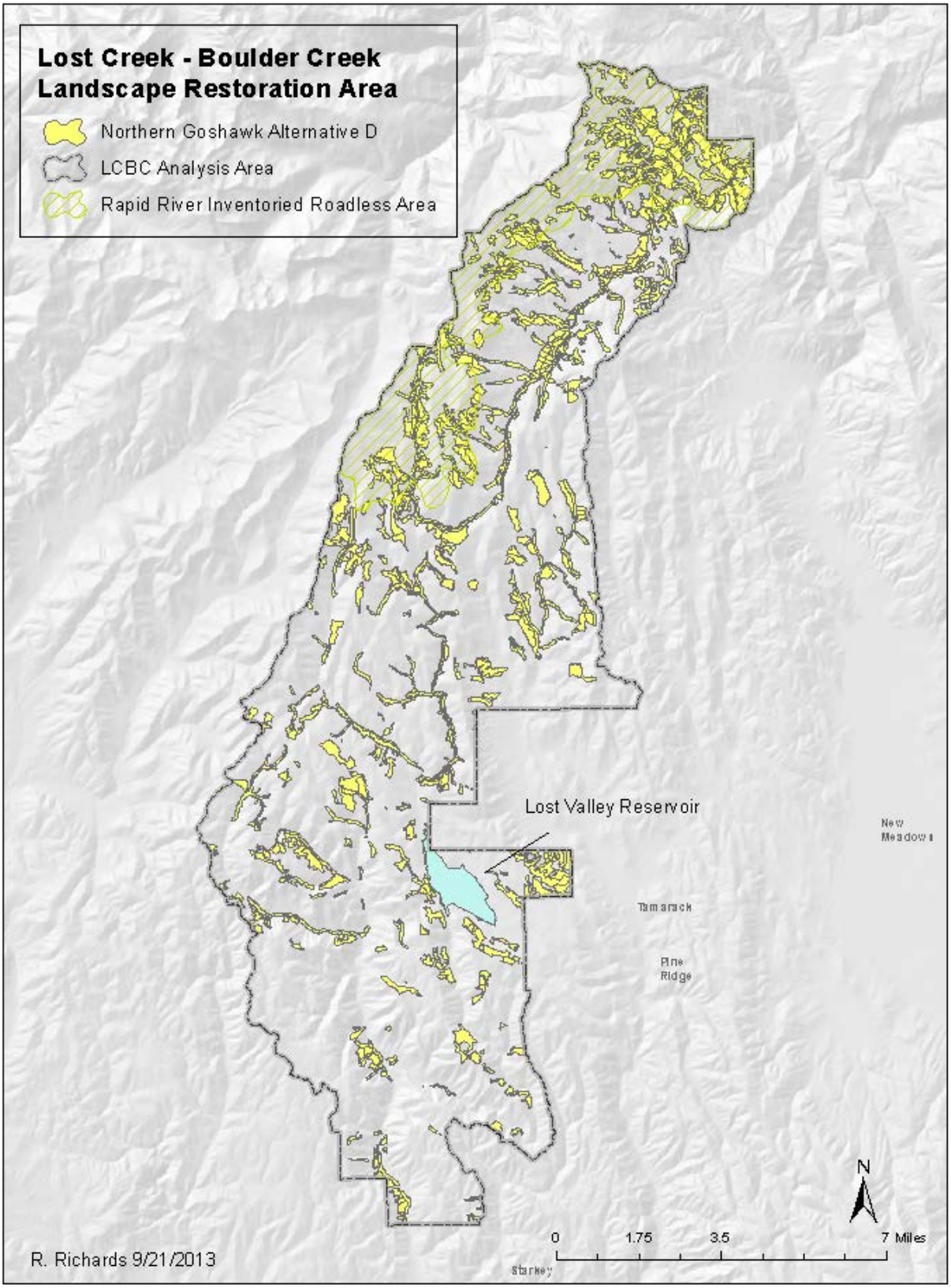


Figure WL-37. Northern goshawk modeled source habitat under Alternative D

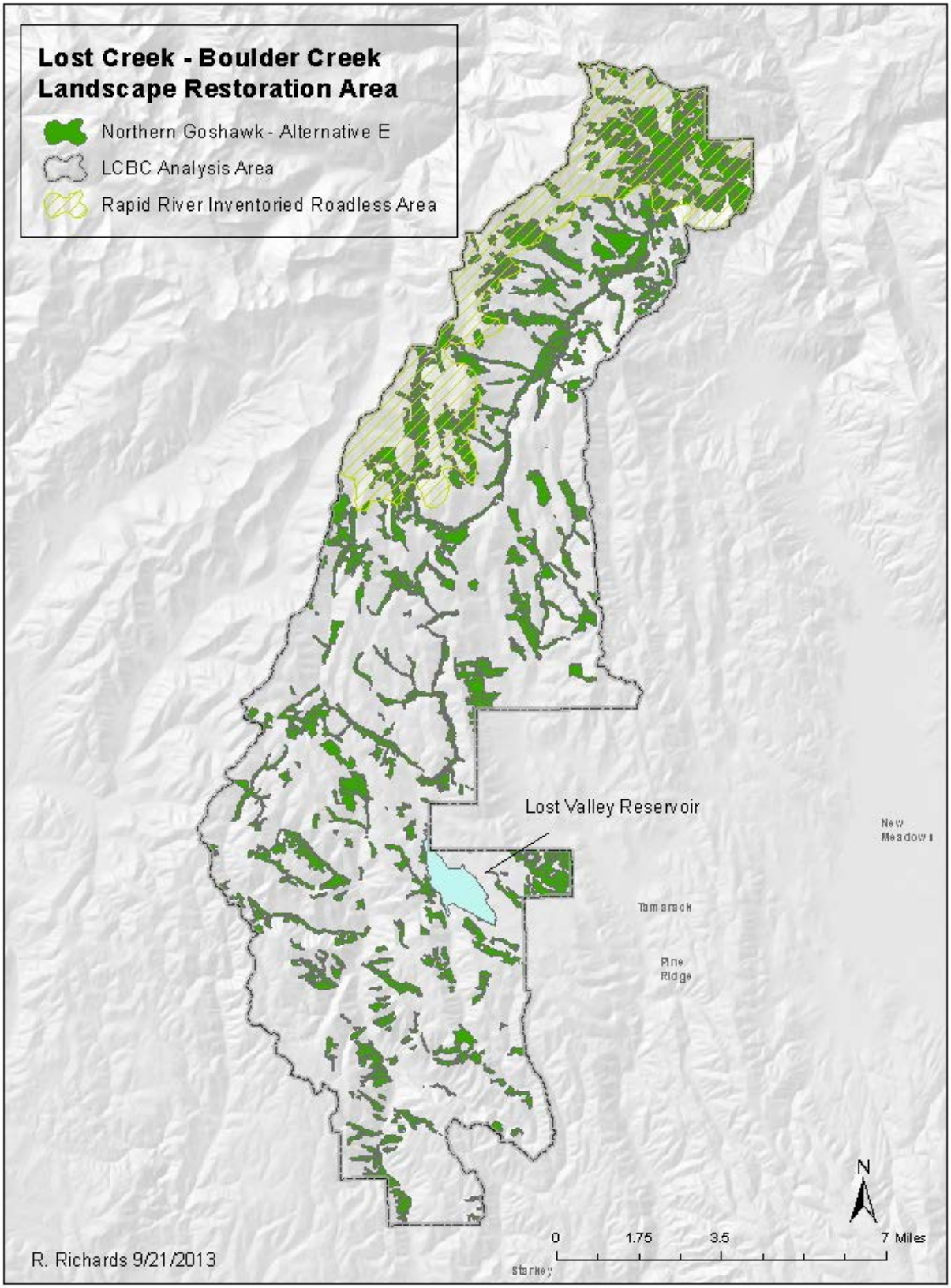


Figure WL-38. Northern goshawk modeled source habitat under Alternative E

Habitat Family 3—Canada Lynx

Effects to Canada lynx are tracked primarily via compliance with standards and guidelines in the Lynx Conservation Strategy and Forest Plan. The primary applicable standards for this project are TEST12, "Vegetative management activities within lynx foraging habitat in LAUs shall not degrade, nor retard attainment of desired habitat for the lynx and its prey…" and TEST15, "If more than 30 percent of lynx habitat within a LAU is currently in unsuitable condition, no additional habitat may be changed to unsuitable habitat as a result of vegetative management projects."

Alternative A - No Action

Vegetative communities capable of providing source habitat conditions for the lynx include PVGs 3, 7, 8, 9, 10, and 11 (USDA Forest Service 2011b). These vegetative communities are found primarily at higher elevations in the watershed and are subject to mixed2 and lethal fire regimes. Hence, these forests are less outside of the HRV as forests at lower elevations that developed under frequent (non-lethal and mixed1) fire regimes. Changes would not likely occur in lynx habitat quantity or quality unless indirectly caused by wildfire, insect or pathogen damage, or blowdown.

Source habitat for lynx was assessed within the Boulder LAU (54,931 acres Forest Service total). The total amount of Canada lynx (potential and currently suitable) habitat in the Boulder LAU is 6,144 acres. In 2012, approximately 3,496 acres of source habitat was altered from the Wesley Fire. The fire perimeter was mostly contained inside the Rapid River IRA where fire intensity and severity was determined to be moderate (author pers.obs).

Effects Common to All Action Alternatives

Under all action Alternatives, no timber treatment activities are planned to occur in modeled habitat (Figure WL -39). Some prescribed fire (493 acres) designated as Priority 2 is proposed under Alternatives B, C, and D (Priority 2 prescribed fire acres may be accomplished under certain conditions, but only after Priority 1 prescribed fire has been implemented in other parts of the Project Area). Under Alternative E, 272 acres of Priority 2 prescribed fire may occur. Any fire treatment would adhere to Forest Plan standards TEST12 and TEST15. Field verification would be required to determine the amount of recently burned acres that would be classified as currently unsuitable. If more than 30 percent of lynx habitat within the Boulder LAU is currently in unsuitable condition, no additional habitat would be changed to unsuitable habitat as a result of this project.

Disturbance from timber harvest is unlikely to affect this species, in part because there are no known populations in the area, but mostly because the activities would occur outside of source habitat.

Connectivity of lynx habitats in the Boulder LAU and Rapid River LAU to the north would be maintained under all alternatives. The Rapid River IRA lies partially in both LAUs, further ensuring that habitat at these higher elevations will not change significantly from Project actions or planned future restoration projects that are part of the CFLRP.

Any of the action alternatives are very unlikely to have an effect on Canada lynx. Lynx are very rare in central Idaho and no lynx have been verified on the west side of the PNF for many years. There was one verified lynx sighting outside of New Meadows in 1957 (Lewis and Wenger 1998, PNF files 2006). During 1999, a national effort was undertaken to collect lynx hair samples for DNA analysis. No evidence of lynx was found on the PNF.

Cumulative Effects

Ongoing and/or foreseeable future activities that could result in cumulative effects to lynx within the project area include fuelwood gathering, recreation uses and improvements on NFS lands, and winter recreation use, primarily snowmobiling. Recently, snow grooming for winter recreation (snowmobiling) was approved from Lost Valley (Rd 128) to (Rd 074) at the Circle C Ranch (USFS 2010). Forest Service road 074 parallels some existing modeled lynx habitat (approximately 600 acres) along Boulder Creek that is disjunct naturally from contiguous habitat inside the Rapid River IRA. The PNF Plan states "During mid or project scale analysis, identify and prioritize opportunities for restoration of habitat linkage zones to promote genetic integrity and species distribution (TEOB09), and Manage recreational activities to maintain lynx habitat and connectivity (TEOB30)". Although this area along the 074 road models as lynx habitat, due to its isolation from higher elevation habitat to the west, it is unlikely that it contributes to the above PNF Plan Objectives. As a result, potential direct and indirect effects to Canada lynx are expected to be negligible and not cumulative with the effects of the above described actions.

Determinations – Alternative A will have *no impact to the Canada Lynx*. The action Alternatives – *May Affect, but are Not Likely to Adversely Affect the species.*

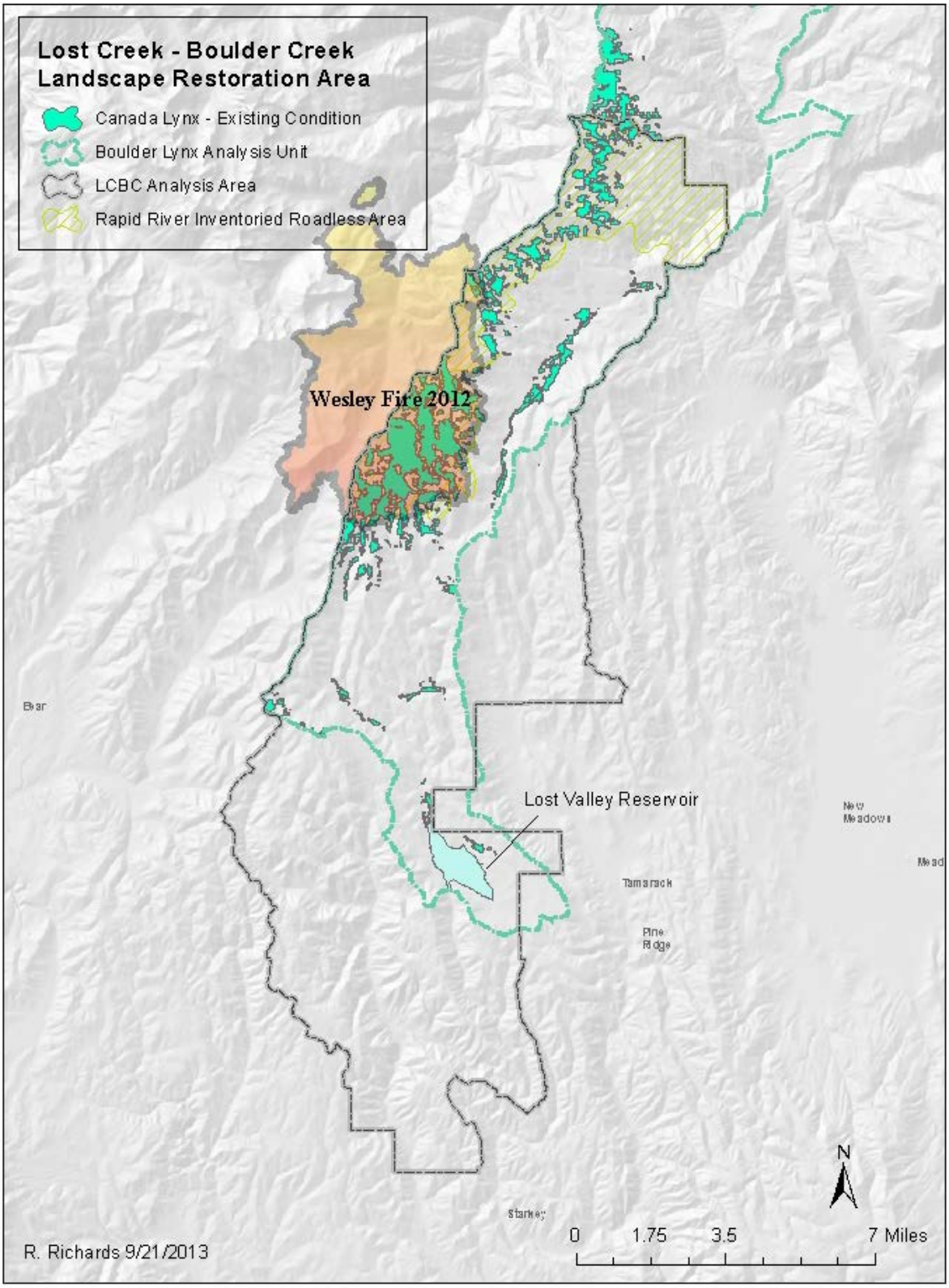


Figure WL-39. Canada lynx modeled source habitat in the Project Area (Boulder Creek Lynx Analysis Unit), by Potential Vegetation Groups (PVGs)

Habitat Family 5—Rocky Mountain Elk

Elk habitat in the Project Area was identified in the early stages of project design. We used the Wildlife Conservation Principles to guide choices in leaving large, interconnected blocks of untreated habitat for elk (Figure WL-40). Sites that had little or no road intrusion were selected over areas with roads, but when such a location was difficult to find, we identified the need for seasonal road management or road obliteration. The difficulty in managing more effectively for elk habitat security was compounded by the high road densities in each of the three sub-watersheds that encompass the project area.

Elk habitat management is complicated by several factors. The Forest does not directly manage the elk population, but our habitat management is important for maintenance of a healthy elk herd. We are directed by the Forest Plan to move towards restoring local habitats to HRV, but restoration activities will decrease forest stand densities, creating more open habitat, which may lead to increased elk vulnerability to human hunters, even though we identify Elk Security Areas, in part, to decrease this same vulnerability to hunting mortality. By opening forested stands with vegetation treatments, we likely will increase elk vulnerability to predation, both from mountain lion and wolves. It is assumed by many that leaving the habitat at current condition would provide more elk security and lessen the potential herd losses to human and wildlife predation, than would occur under the action Alternatives. However, without an aggressive road closure/obliteration program throughout the project area, it is difficult to see how leaving the habitat at current condition would continue to support current population levels of elk for the long term.

Another factor that became important in our understanding of elk habitat management in this area was the fact that wolves are now present throughout the project area and contributes to a different level of concern by the public about local elk management issues. Although the Forest has no direct wolf population management authority, the Forest manages most of the habitat that supports the elk population. IDFG has identified elk herd population objectives that provide hunting recreation and the much needed state agency revenue. Forest and IDFG agreements depend on the Forest Service to manage habitat appropriately for this desirable game animal. However, the Forest also is required to manage for a resilient ecosystem, including viable populations of key predators, and the Forest Plan directs the need for landscape restoration, which also may eventually lead to lower elk populations. Leaving the Project Area with no vegetation treatment could eventually lead to uncharacteristic wildfires, reduction or loss of elk habitat security, and long-term reductions in the local elk population.

Elk Security Analysis

Alternative A – No Action

Ten ESA were identified (numbered 0 to 9; see Figure WL-8) ranging in total size from 778 acres (ESA #8) to 13,084 acres (ESA #0). Within these ESAs the amount of hiding cover was determined (Table WL-19). All ESAs contained at least 250 acres of modeled hiding cover (range 248 – 6,742 acres). The ten ESAs total about 36,000 acres in size in which approximately 10,280 acres (29 percent) of hiding cover is provided in medium and large tree stands and 4,260 acres (12 percent) may be provided in plantations (additional field verification is necessary). The existing condition of the amount of hiding cover in the ESAs in the Project Area is slightly under the goal of 30 percent when only moderate and large tree stands are considered, but exceeds the goal by more than 10 percent when plantations are included. The ability of the plantations to provide hiding cover needs additional field review, but surveys to date indicate that many plantations do provide cover.

Action Alternatives

All the action alternatives reduce the amount and density of forested elk habitat in the project area (Table WL-19, Figures WL-40-43). Initially, it would seem more beneficial to elk security to retain all of the forested stands at current condition. However, without treatments to move vegetative conditions toward HRV, areas of forested habitat could be altered by future wildfires, some of which could be stand-replacing. Leaving the Forest at currently departed conditions would not only deviate from Forest Plan direction and the science behind the WCS, but may be considered shortsighted. The desire of IDFG to maintain a healthy elk population in this area places a greater responsibility on the Forest to expand on our landscape restoration efforts, including a more aggressive reduction in road density in this area.

Under all action alternatives, the vegetative condition of the Elk Security Areas would change. In addition, all established Elk Security Areas would receive some prescribed fire treatments. Implementation of any one of the action alternatives would not lead to the total loss of Security Areas (Table WL-19), or the local elk herd. However, landscape treatments may alter elk habitat enough to eventually lower the elk population. Elk herd sustainability would come from the supporting habitat being more aligned to natural ecosystem function, including vegetation structure and distribution, appropriate fire regimes, adaptations to warmer climatic conditions, and wildlife populations at sizes and distributions that are appropriate for local conditions at HRV.

Table WL-19. Acres of Hiding Cover in each Elk Security Area (ESA) by Alternative

Elk Security Areas (total acres, acres of hiding cover and potential hiding cover)[5]											
ESA	Total Area	A		B		C		D		E	
		Cover	Pot. Cover	Cover	Pot. Cover	Cover	Pot. Cover	Cover	Pot. Cover	Cover	Pot. Cover
0	13,084	5,417	1,325	5,125	476	5,275	953	5,022	476	5,091	818
1	2,093	259	637	201	175	221	380	45	172	45	297
2	3,945	1,269	103	1,226	16	1,236	62	1,212	16	1,212	76
3	996	100	215	35	61	73	85	35	61	48	72
4	1,468	265	146	100	34	200	65	90	34	131	70
5	5,647	1,430	1,126	635	389	1,109	583	560	389	771	584
6	2,012	381	180	152	43	300	43	27	43	166	119
7	4,083	767	329	158	27	582	53	53	27	365	27
8	778	51	197	0	41	43	92	0	41	15	2
9	1,946	344	6	122	0	246	0	36	0	204	0
Totals	36,052	10,283	4,264	7,754	1,262	9,285	2,316	7,080	1,259	7,500	2,065

Each ESA meets the objective of containing a minimum of 250 acres in hiding cover. ESA #8 barely meets the objective. Under the action alternatives, ESAs #0, 1, 2, and 5 would continue to meet this objective; some areas only with the addition of potential cover in plantations. ESAs #3 and #8would fall below the objective in all action alternatives. Alternative C best preserves the minimum amount of hiding cover for all ESAs and, specifically, preserves hiding cover in ESAs #0, 1, 2, 4, 5, 6, 7, and 9. Alternative E is the

[5] Hiding cover is defined as "cover" based on strata 23, 24, 34, 35 and "potential cover" based on stratum 32

next best alternative at preserving hiding cover – preserving the minimum of 250 acres in #0, 1, 2, 5, 6, 7, and 9.

Figures WL 40-43 provide a graphical representation of how the patch and pattern of elk security would change by alternative. The figures included planned commercial treatments in moderate and large tree stands, along with pre-commercial thins in plantations at maximum treatment levels. As described previously, commercial treatment acres may be overestimated by a factor of 20 percent or more. In addition, the amount of pre-commercial treatment may vary considerably. Finally, in this analysis only the effects of mechanical treatments were considered. The effect of burning would vary depending on weather conditions and the amount of understory fuels.

Table WL-20. Percent Hiding Cover in each Elk Security Area (ESA) by Alternative

Elk Security Areas (change in percent in hiding cover and potential hiding cover)[6]											
ESA	**Total Area**	**A**		**B**		**C**		**D**		**E**	
		Cover	Pot. Cover	Cover	Pot. Cover	Cover	Pot. Cover	Cover	Pot. Cover	Cover	Pot. Cover
0	13,084	41	10	40	4	40	7	39	4	39	6
1	2,093	8	30	10	8	10	18	2	8	2	14
2	3,945	32	3	31	0	31	2	31	0	31	2
3	996	10	22	4	6	7	9	4	6	5	7
4	1,468	18	10	7	2	14	4	6	2	9	5
5	5,647	25	20	11	7	20	10	10	7	14	10
6	2,012	19	9	8	2	15	2	1	2	8	6
7	4,083	19	8	4	1	14	1	1	1	9	1
8	778	7	25	0	5	5	12	0	5	2	0
9	1,946	18	0	6	0	9	0	2	0	10	0
Totals	36,052	29	12	22	4	26	6	20	4	21	6

Across the project area all ten ESAs combined provide the minimum amount (30 percent) in elk hiding cover. Only 2 of the ESAs (#0 and #2) currently provide 30 percent or more hiding cover in moderate and large tree stands by themselves. These ESAs occur mostly within the IRAs and at higher elevations, so relatively low amounts of harvest have occurred across the areas. Under all the action alternatives, hiding cover is maintained in ESAs #0 and #2. In ESA #0, selected stands on the southeast edge of the area would receive vegetation treatments. The remaining portions are inside the Rapid River IRA and would not be treated.

ESA #5 also occurs mostly at higher elevations with 25 percent hiding cover in moderate and large tree stands. With the addition of plantations, almost half of this ESA (45 percent) is currently in hiding cover. Only Alternative C would maintain 30 percent of ESA #5 in hiding cover. All the other action alternatives would remove more than half of the hiding cover.

[6] Hiding cover is defined as "cover" based on strata 23, 24, 34, 35 and "potential cover" based on stratum 32. Highlighted areas meet the 30 percent goal in that specific ESA.

Hiding cover in ESA #1is provided mostly by plantations which cover 30 percent of the area. Moderate and large tree stands that provide hiding cover occur across about 8 percent of the ESA. In total about 900 acres of hiding cover is currently provided. This would drop to 18 percent (about 375 acres) under Alternative B, 28 percent under Alternative C, 10 percent under Alternative D, and 16 percent under Alternative D.

ESA #3 is one of the smallest areas of elk security at 996 acres and only 10 percent of the ESA (about 100 acres) occurs in moderate and large tree hiding cover. With the addition of 215 acres of plantations, 30 percent of the ESA may provide hiding cover, but it is unlikely the area is very secure. The amount of ESA #3 in hiding cover drops to 16 percent in Alternative C and 10 percent in alternatives B and D.

Security in many of the ESAs is affected by the amount of the area in grassland and brush. This provides for a good juxtaposition of cover to forage, but reduces the overall amount of hiding cover in the ESA. The majority of ESA #4 is a mix of grassland/sagebrush and timber. ESA #6 is primarily grassland/brush on the south facing slopes with forested stands on the northerly aspects. This area is considered part the northern portion of elk winter range in the project area. ESA #7 is similar to Area #6 and is considered to be on the edge of winter range in the project area. The habitat is more of a mosaic of grassland/shrub on the southerly aspects and timbered on northern aspects.

In the southern ESAs, treatments to restore habitat for northern Idaho ground squirrel habitat may affect the condition of elk hiding cover. ESA #8 is one of the smaller areas at 778 acres. It lies south of Lost Valley Reservoir and is has been heavily managed in the past. Although it is considered security for elk, it has a closed network of roads that can facilitate hunting mortality. ESA #9 is in the Warm Springs area on the southern border of the project area. It also is similar to Area #6 but has less timber and more grassland/forbs and browse. The area could also be considered elk winter range or calving habitat depending on winter snow distribution.

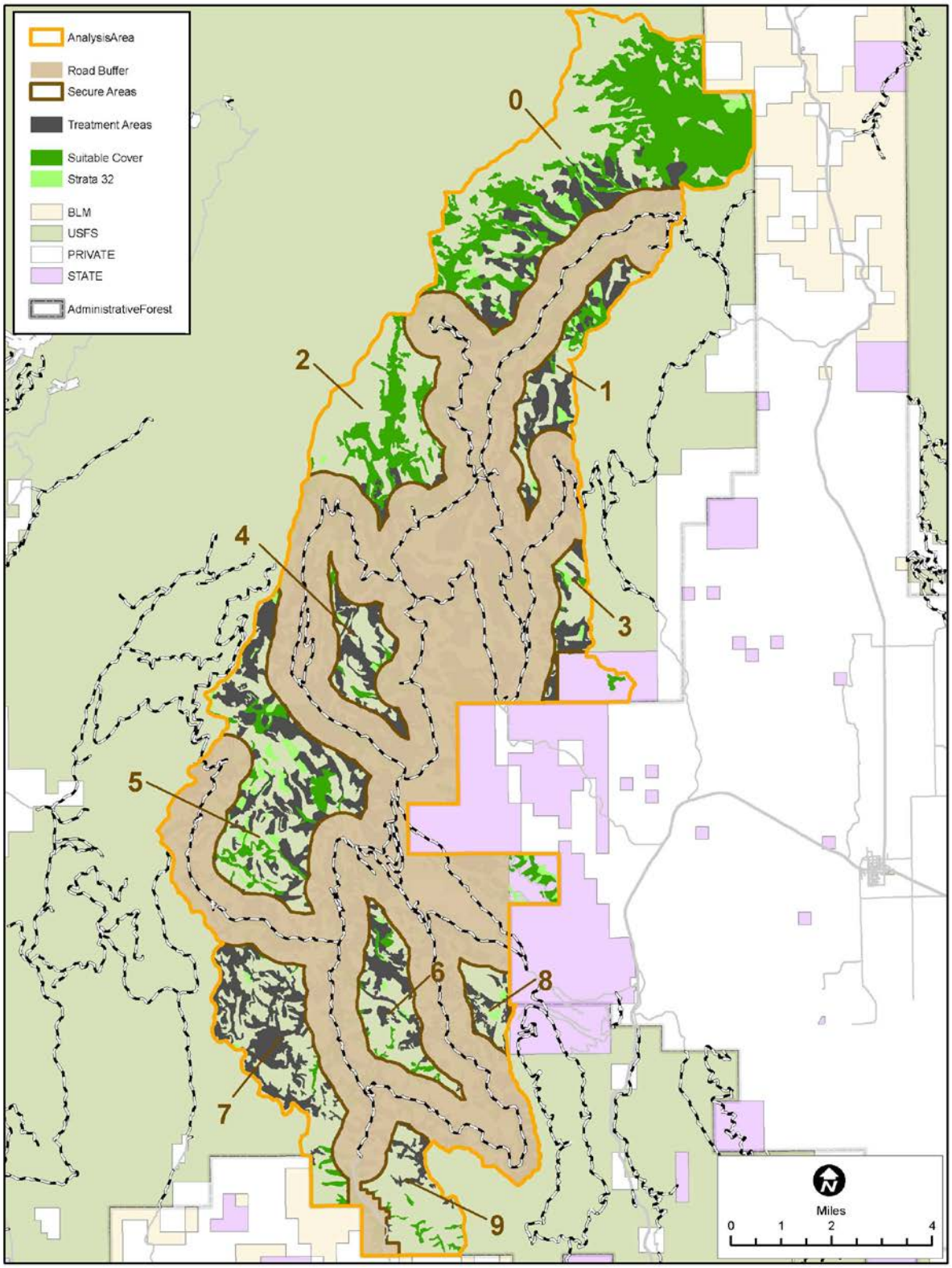


Figure WL-40. Modeled elk hiding cover in moderate and large tree stands and plantations treated under Alternative B.

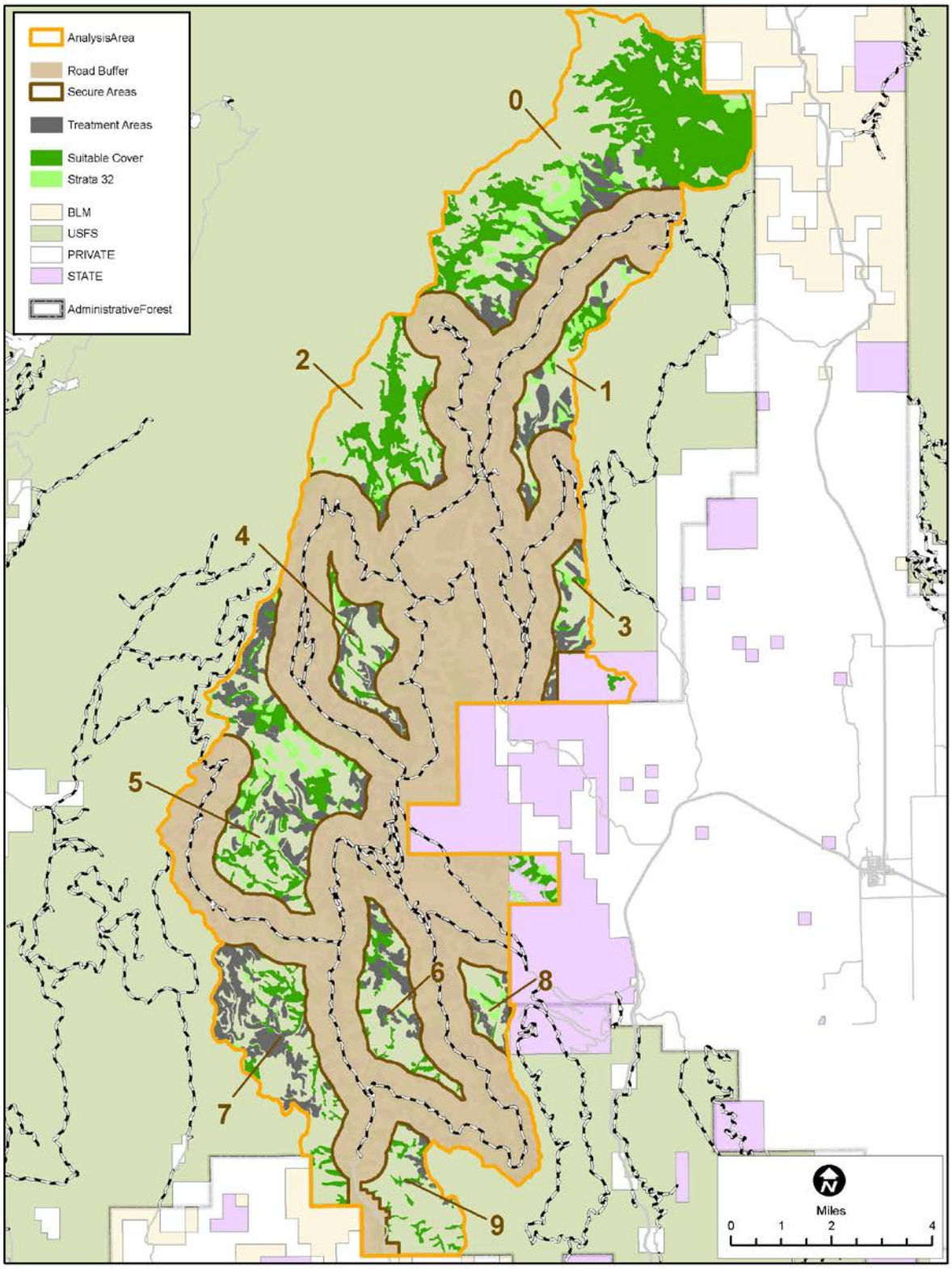


Figure WL-41. Modeled elk hiding cover in moderate and large tree stands and plantations treated under Alternative C.

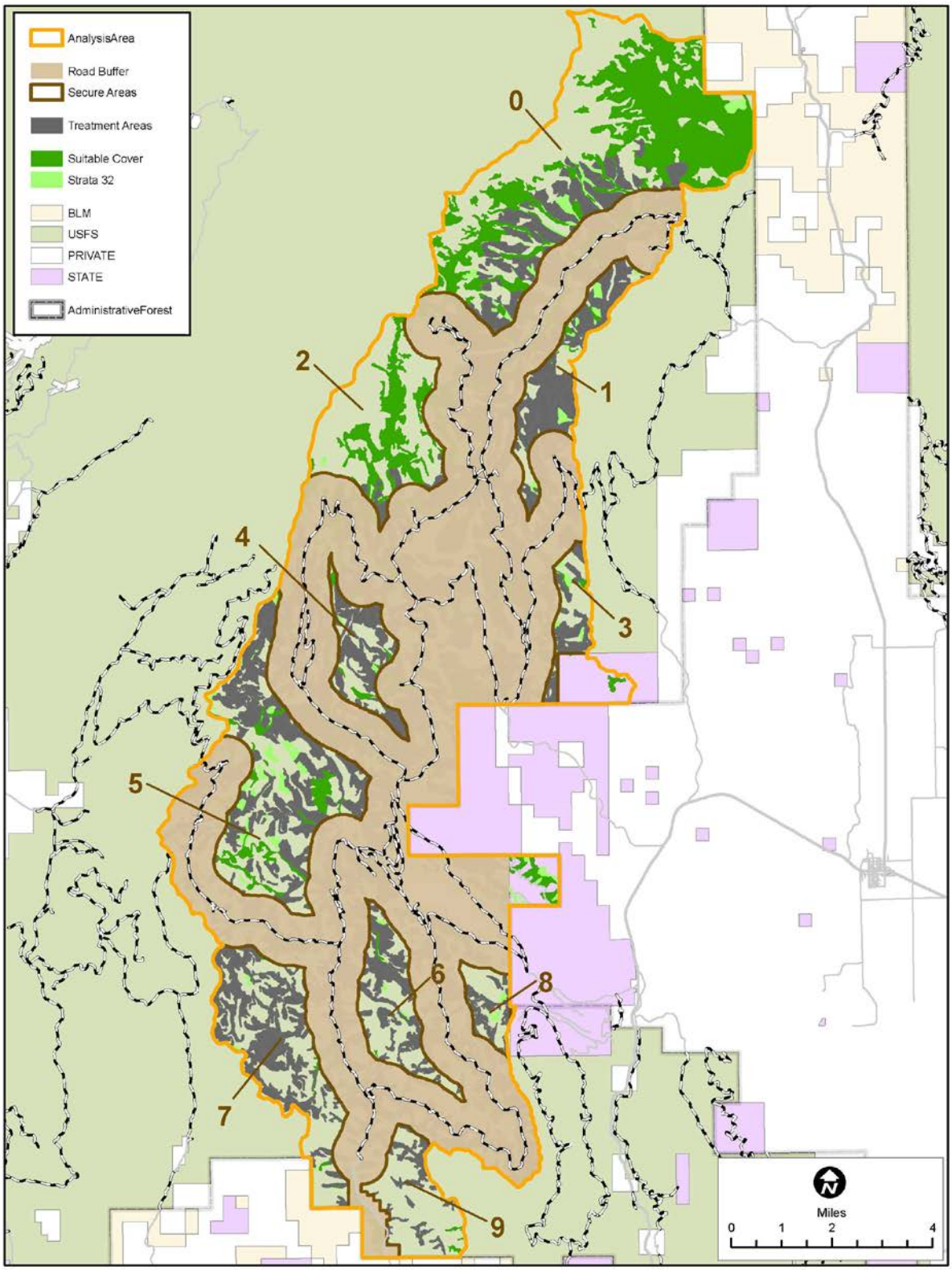


Figure WL-42. Modeled elk hiding cover in moderate and large tree stands and plantations treated under Alternative D.

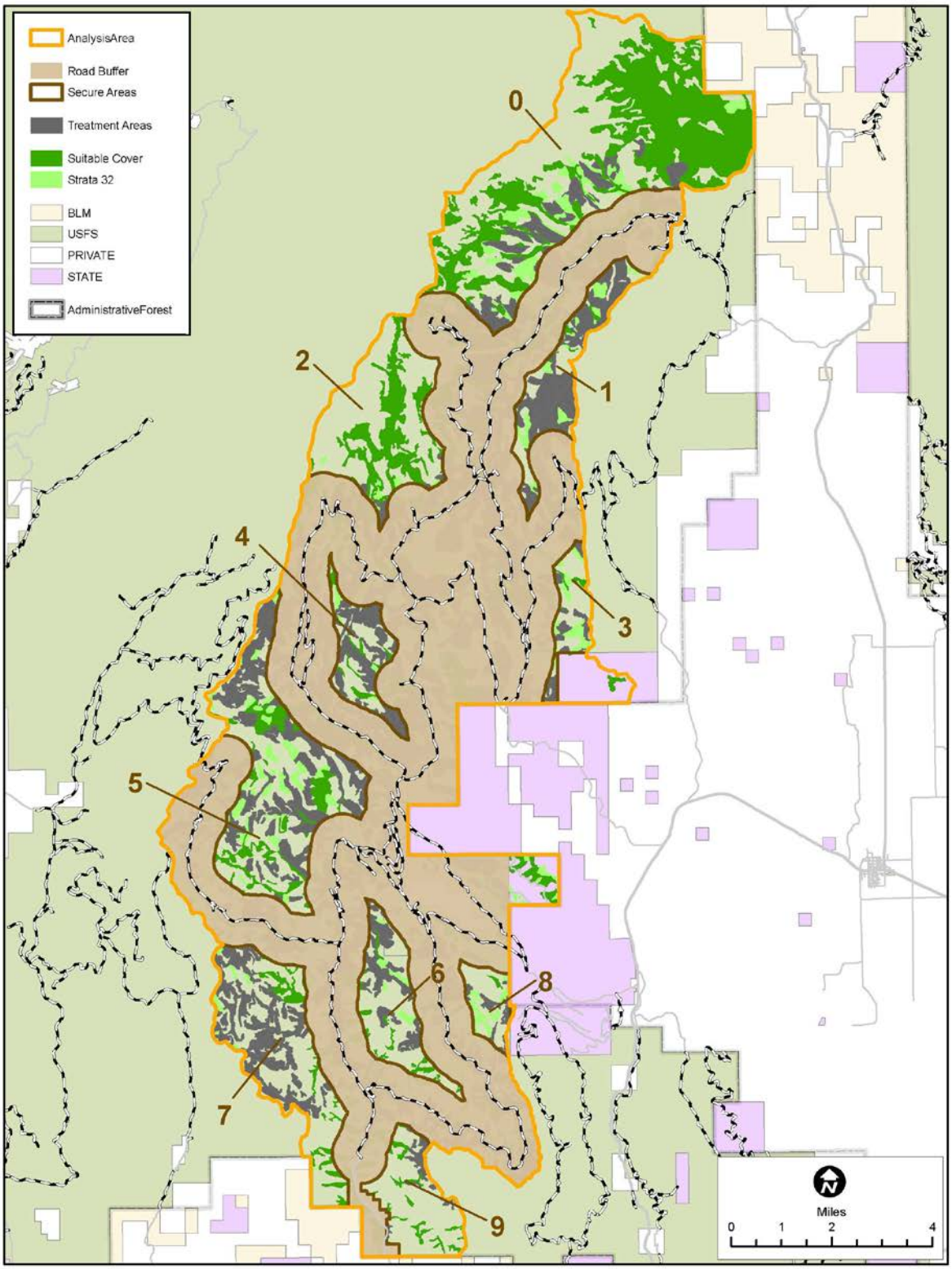


Figure WL-43. Modeled elk hiding cover in moderate and large tree stands and plantations treated under Alternative E.

Unauthorized Routes and Closed System Roads

The overall issue of concern for elk habitat management in the project area is the high road density and how that open road system alters habitat security available to elk. Elk habitat effectiveness is a function of the quantity and quality of available habitat components, as well as the density and distribution of roads accessible by motorized vehicles. Each action alternative analyzed for the project decreases the amount of elk security cover through the restoration oriented activities of thinning and reduction of canopy closure. Without treatment, these forested stands would retain the dense habitat characteristics required by elk for hiding and thermal cover (Thomas 1979).

Changes in road density and distribution, combined with changes in the amount and distribution of habitat under each alternative, result in a level of complexity that likely cannot be completely evaluated for elk management. Rowland et al. (2005) suggested using a Distance Band GIS Analysis for determining the effects of high road density on elk habitat effectiveness, but they still included habitat security as a function of decreasing vulnerability of elk to hunting mortality. A summary of changes in road management is shown in Table WL-21.

Some level of unauthorized roads would be removed from the landscape under all action alternatives. Some of these roads would be improved, used for restoration treatments, and then obliterated or decommissioned. Other unauthorized roads not used, would be obliterated to provide soil, water, wildlife, and fish benefits. Alternative C provides the greatest benefits from removal of unauthorized roads and long term closure of NFS roads.

Table WL-21. Proposed changes in roads by Alternative for Upper Weiser River, West Fork Weiser, Middle Little Salmon River, 5th HUCs for the Lost Creek-Boulder Creek Project Area that may affect elk security.

Road Status	Alternative B	Alternative C	Alternative D	Alternative E
Decommission	68.8	132	68.8	51.4
Improve/Open	3.6	0	3.6	3.6
Long Term Closure	78.5	104.6	78.5	95.9
Maintain/Improve	254.2	227.4	302.1	302.1
New Long Term Closure	59.5	.75	11.6	11.6
Non-Motorized Travel	.7	0	.7	.7
Trail Conversion	11.5	11.9	11.5	11.5
Totals	~ 477	~ 477	~ 477	~ 477

Full removal of unauthorized roads from the landscape and effective closures of NFS roads not open to public use provides additional benefits elk security. Under all action alternatives, roads used for the timber harvest (many of which may have naturally revegetated since the last period of use) would have a more obvious roadbed. It is essentially that those roads placed into long-term closure have effective barriers to unauthorized use. Eight closed or seasonally closed FS system roads, totaling about ten miles, have known existing ineffective closures. Under each action alternative, these ineffective closures would be improved through the use of gates or other barriers. Wildlife, elk in particular, would benefit from all decommissioning (whether full obliteration or effective administrative closure) and the road to trail conversion.

Alternative C would provide the most benefits to elk security, considering both the amount of elk habitat retained from the restoration and the overall road system changes. Although Alternative C still has a high number of miles maintained or improved to the FS System, it also provides more miles of unauthorized road decommissioning/obliteration and more miles of road placed into long term closure. Alternative E provides the next most favorable benefits to elk security in the project area.

Cumulative Effects

Ongoing and/or foreseeable future activities that could add to impacts on elk within the analysis area are summarized in Appendix D. Actions on NFS lands that may cumulatively impact this species include opening closed roads to allow for fuelwood removal. Private and State lands open to timber harvest are expected to have low levels of large trees, seral species, old forest conditions, and snags, both currently and in the future. Alternative C closes or decommissions more unauthorized routes than any other alternative, resulting in the greatest cumulative offset for other actions in the project area. Unauthorized use of ATV/UTV use on non-system, closed roads will likely remain an issue for elk security. Reduction in funding for access management (e.g. gate maintenance) and law enforcement continue to exacerbate this ongoing problem. If unauthorized use of Forest generated routes (temp roads, skid trails, etc.) continue to have precipitous effects to bull elk survival, over the long term it may be necessary for IDFG to recommend changes in hunt season structure which could be more restrictive.

Determinations

No official effects determination is required for elk, because it is a Species of Special Interest; the species is not federally-listed, nor is it a Region 4 Sensitive species.

Elk Winter Range

When winter range vegetation treatments are combined with proposed prescribed fire by alternative, Alternatives D and B treat the most acres collectively; followed by Alternatives E and C, respectively. Because thermal cover during winter can be an important variable that can improve over winter body condition, removal of the overstory can be detrimental to elk survival. In that regard, Alternative C that proposes more acres of periodic prescribed fire and less timber harvest may be the most beneficial for forage production.

Table WL-22. Vegetation Treatments on Elk Winter Range (Acres).

	Alternative B	Alternative C	Alternative D	Alternative E
No Vegetation Treatment	969	1,173	742	1,097
Free Thin	1,351	582	1,552	1,094
Free Thin - Biomass	492	309	492	420
Pre-commercial thin	80	74	80	56
Rx Fire Only	3,695	4,449	3,587	3,919
Shelterwood	0	0	135	0

Elk Calving

The action alternatives effects on modeled elk calving habitat follow a similar pattern when compared to elk security and winter range (Figure WL-44). Alternative D and B treat the most vegetation and ultimately receive the most prescribed fire because most of the vegetation treatments are complimented with prescribed fire in addition to the prescribed fire only acres. Alternative E is the least invasive on existing calving habitat, but also implements less prescribed fire (500-700 acres). Decadent browse conditions due to absence of periodic fire can negatively affect lactating cow elk. Past prescribed fire projects in the Warm Springs area of the project area have led to increases in elk use (author pers.obs).

Table WL-23. Modeled Calving Habitat by Alternative (Acres).

	Alternative B	Alternative C	Alternative D	Alternative E
No Treatment	621	599	622	1,370
Free Thin	483	338	493	463
Free Thin - Biomass	423	344	423	289
Pre-commercial thin	158	137	158	83
Rx Fire Only	4,077	4,304	4,067	3,558

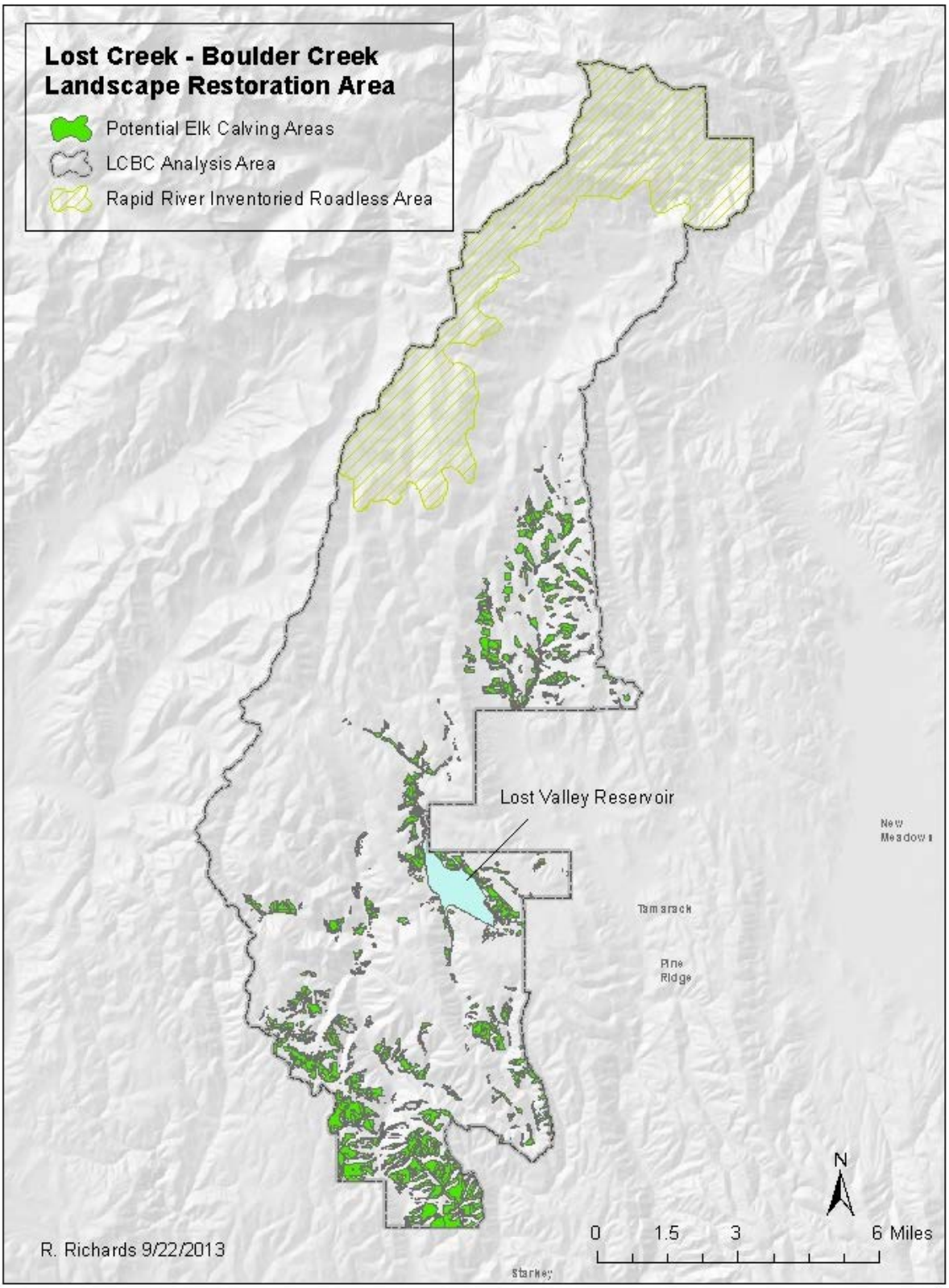


Figure WL-44. Potential elk calving areas, existing condition, Lost Creek - Boulder Creek Restoration Area

Cumulative Effects

Ongoing and/or foreseeable future activities that could add to impacts on elk within the analysis area are summarized in Appendix D. Actions on NFS lands that may cumulatively impact this species include opening closed roads to allow for fuelwood removal. Private and State lands open to timber harvest are expected to have low levels of large trees, seral species, old forest conditions, and snags, both currently and in the future. Alternative C closes or decommissions more unauthorized routes than any other alternative, resulting in the greatest cumulative offset for other actions in the project area. Unauthorized use of ATV/UTV use on non-system, closed roads will likely remain an issue for elk security. Reduction in funding for access management (e.g. gate maintenance) and law enforcement continue to exacerbate this ongoing problem. If unauthorized use of Forest generated routes (temp roads, skid trails, etc.) continue to have precipitous effects to bull elk survival, over the long term it may be necessary for IDFG to recommend changes in hunt season structure which could be more restrictive.

Determinations

No official effects determination is required for elk, because it is a Species of Special Interest; the species is not federally-listed, nor is it a Region 4 Sensitive species.

Habitat Family 12—Northern Idaho Ground Squirrel

The northern Idaho ground squirrel (NIDGS) is one of the rarest, least studied, and most geographically restricted of the North American ground squirrels (Gill and Yensen 1992). This species currently occupies 53+ known isolated sites in Adams and Valley Counties, Idaho, with a range of about 160+ square miles. In 1985, the total population at 18 known sites was about 5,000 individuals (Yensen 1985). In 1997, the population had declined to less than 1,000 individuals distributed at 19 sites (Sherman et al. 1997). Based on population surveys in 2012, the total population estimate was 1,554-2,403 individuals (IDFG 2012). As stated in Wisdom et al. (2000), source habitat for the NIDGS has decreased by 73 percent from basin-wide historical levels.

Pursuant to the ESA, the USFWS listed the NIDGS as a threatened species throughout its range in western Idaho in April, 2000. The species is considered to be threatened primarily as a result of habitat loss and fragmentation caused by fire exclusion and forest encroachment into former montane meadow habitats (USDA Forest Service and USDI Fish and Wildlife Service 2000). The entire Project Area has sustained fire suppression within the last 60 years, and as a result only a minimal amount of acreage has burned. Other threats may include land use changes (e.g., alterations in vegetation, road construction and maintenance, recreational facilities), recreational shooting, poisoning, genetic isolation and genetic drift, random naturally occurring events, and competition from the larger Columbian ground squirrel (Spermophilus columbianus) (Ibid).

Preferred habitat includes shallow, dry rocky meadows usually associated with deeper, well-drained soils and surrounded by ponderosa pine and/or Douglas-fir forests at elevations of about 3,000 to 5,400 feet (Ibid) and in rare cases occasionally up to 7,500 feet. Seeds of grasses and forbs, lupines, and composites are important, while roots, bulbs, leaf stems, and flower heads are a minor component of their diet (Ibid). Approximately 17,605 acres of restorable habitat occurs in the project area (Figure WL-46). Of the 17,605 acres in the Project Area, approximately 954 acres in the proposed Project Area are currently suitable and occupied on Forest Service managed lands. As of 2013, NIDGS is known to occur at approximately 32

locations within the Project Area with a total population estimate of 302 individuals. Existing habitat is of marginal quality due to very patchy and fragmented areas caused by conifer encroachment (Sherman and Runge 2002). The Lost Creek side of project area is considered to be within probable NIDGS historic distribution (USDA Forest Service and USDI Fish and Wildlife Service 2000).

During the development phase of the CFLRP for the Payette, restoration of NIDGS habitat was considered to be an overriding factor. Much of the Lost Creek side of this restoration project was chosen to help facilitate NIDGS recovery on a landscape level by implementing the Recovery Plan for the Northern Idaho Ground Squirrel (USFWS 2003). The ultimate goal of the Recovery Plan is to improve the status of NIDGS populations so the species can be delisted. In addition to the Recovery Plan, the Lost Creek – Boulder Creek Landscape Restoration Project has the potential to compliment previous NIDGS habitat improvement projects at East Fork Lost Creek and the former Slaughter Campground that is now a NIDGS Interpretive Site/Trail.

In addition to habitat improvement projects that have been completed by the PNF, the University of Idaho is currently partnering with several agencies (USFWS, IDFG, and USFS) to determine the efficacy of habitat treatments. Part of the treatment areas in this project will facilitate that dissertation research.

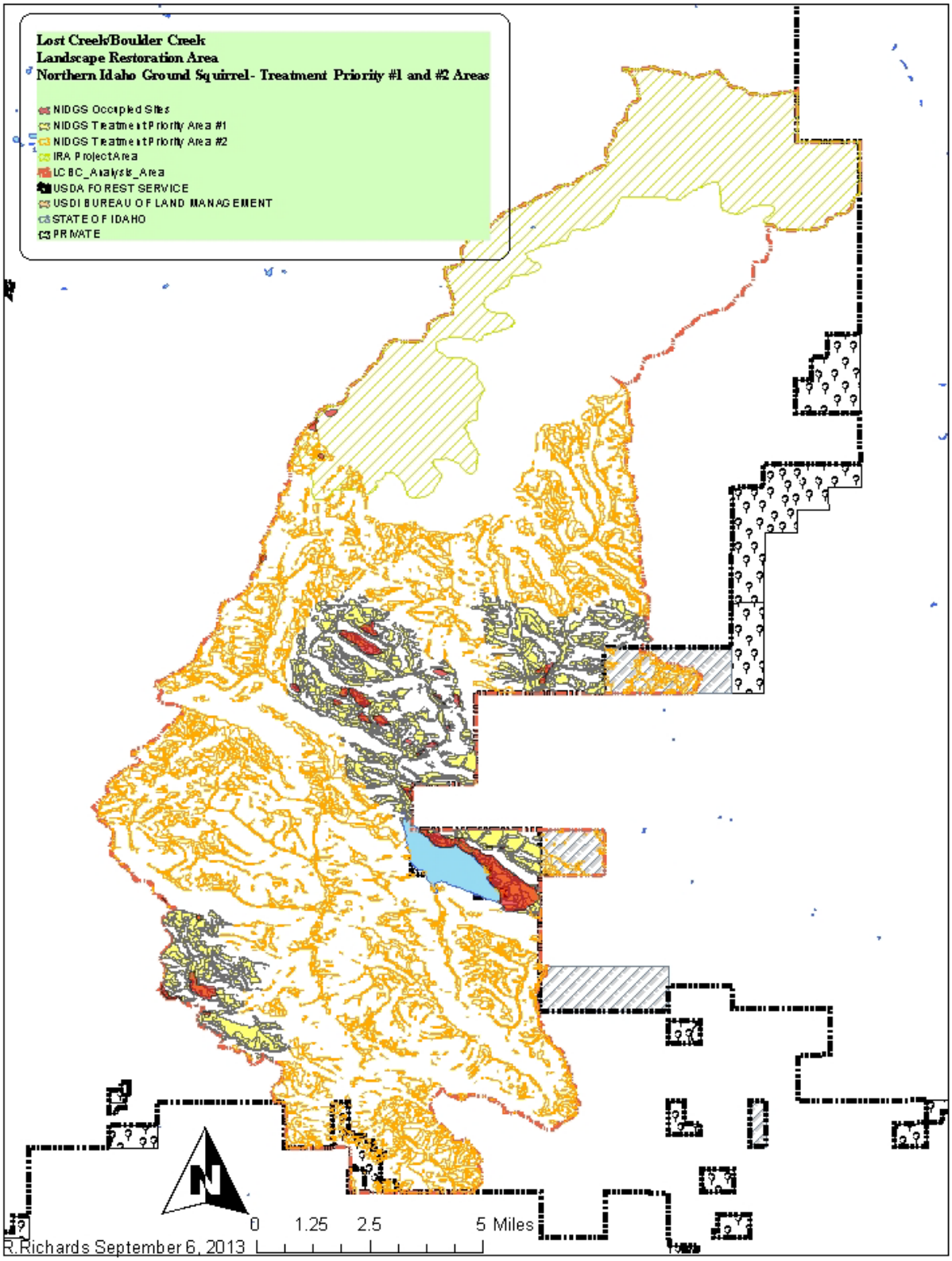


Figure WL-45. NIDGS treatment Priority #1 and #2 Areas – Including Metapopulation areas - 4th of July, Lost Valley-Butter Gulch, and Price Valley (left to right)

Alternative A - No Action

As previously mentioned, several northern Idaho ground squirrel populations are known to occur in the project area, including substantial potential/restorable habitat that would not be treated under the No Action alternative. The absence of prescribed fire treatments and/or reduction in conifer encroachment in these areas would most likely continue the trend of habitat degradation. The prescribed fire and reduction in canopy closure planned for these habitats would not occur, limiting rejuvenation of bunchgrasses, forbs, and some shrubs. In the long term, lack of fire would lead to a decrease in quantity and quality of modeled source habitat and fragmentation. Road decommissioning that is proposed directly and indirectly affects NIDGS and would not be accomplished. Unauthorized routes in occupied habitat increase the likelihood of plinking or and/or noise disturbance. Additionally, the Forest Service would be negligent in its partnership with the U.S. Fish and Wildlife Service in implementing the 2003 Recovery Plan.

Action Alternatives

Surveys over the past decade have discovered several small, isolated populations scattered around the project area. Under the forthcoming revision of the existing 2003 Recovery Plan, three metapopulation areas will be designated in the Lost Creek watershed. Under the action alternatives these metapopulation areas, 4th of July, Lost Valley-Butter Gulch and Price Valley, serve as the focus of NIDGS habitat restoration in the project area. Using the existing NIDGS potential habitat model for GIS that is based on soils, elevation, slope, aspect and vegetation, it was determined that approximately 17,037 acres of habitat exists in the project area. To further refine restoration efforts NIDGS was broken down into two categories, Priority 1 and Priority 2 treatment areas. Priority 1 areas are modeled habitat that is within ¼ mile of existing known colonies. Priority 2 areas are more than a ¼ mile from existing populations but exhibit the potential to be restored habitat or serve as corridors to connect fragmented habitat and forthcoming expanding populations. Habitat improvement would consist of the following approach:

NIDGS – Priority #1 Areas – Within ¼ mile of occupied habitat, and within USFWS Recovery Plan metapopulation areas, use understory thinning and prescribed fire (~3-7 year intervals) to improve foraging conditions in modeled NIDGS habitat to achieve 15-30 percent canopy closure and high quality forage. Newly discovered populations (over the next ten-years) would be considered Priority #1, also. Use of project design features (PDF's) will be incorporated into the implementation to minimize/mitigate adverse effects (see Chapter 2 of EIS).

NIDGS – Priority #2 Areas – In modeled NIDGS habitat outside of metapopulation areas, treat same as above, but later in time. Large blocks of NIDGS habitat in Priority #2 should be linked with treated Priority #1 areas to improve immigration and emigration of NIDGS.

Tables WL-24 and WL-25 below describes the treatments by alternative for the two Priority areas. For Priority #1, Alternative D and E are the most aggressive from a timber thinning perspective, followed by Alternatives B and C. However, Alternative C proposes more prescribed fire than the other alternatives to offset less overstory treatment. Prescribed fire is an important element for improving and maintaining high quality forage NIDGS habitat as they are food limited (Yensen pers.com.).

Table WL-24. Priority #1 Habitat Treatments (Acres)

	Alternative B	Alternative C	Alternative D	Alternative E
No Treatment	621	599	622	1,370
Free Thin	483	338	493	463
Free Thin - Biomass	423	344	423	289
Pre-commercial thin	158	137	158	83
Rx Fire Only	4,077	4,304	4,067	3,558

Table WL-25. Priority #2 Habitat Treatments (Acres)

	Alternative B	Alternative C	Alternative D	Alternative E
No Vegetation Treatment	2,498	2,739	2,412	3,765
Free Thin	2,076	1,184	2,378	2,221
Free Thin - Biomass	1,200	864	1,200	802
Pre-commercial thin	128	95	128	80
Rx Fire Only	5,420	6,440	5,164	4,428
Shelterwood	0	0	39	26
Total	11,322	11,322	11,321	11,322

The Priority #2 area alternatives follow a slightly different pattern as related to overstory removal. Alternative D is the most aggressive followed by B, E and C. Again, Alternative C proposes more prescribed fire than the other alternatives. Alternative E proposes to leave more modeled habitat in its current state, which will not likely help recover the species as quickly as the other alternatives.

All of the action alternatives help improve the existing condition of NIDGS habitat. Because the species evolved under conditions that experienced more frequent fire, moving toward HRV as outlined in the draft WCS is beneficial to the species. The mosaics and interconnections of habitat that would likely be generated would facilitate immigration, emigration and genetic interchange that would make the species more resilient over a larger, landscape scale. Changes in road densities under each of the action alternatives have the potential to reduce impacts to existing and expanding NIDGS populations. Again, Alternative C proposes the most road decommissioning that would result in the most benefit for this species.

Cumulative Effects

The Lost Creek-Boulder Creek Project area was chosen on the premise that NIDGS which currently inhabit the landscape could be expanded into vacant suitable and/or restorable habitat. The New Meadows Ranger District has treated occupied habitat near Lost Valley and observed expansion in population from approximately fifty individuals in the 1990's to approximately two-hundred presently. Other projects such as East Fork Lost NIDGS Habitat Improvement Project with similar vegetation and prescribed fire prescriptions, attempted to link existing, small isolated populations and habitat together to facilitate population expansion. Because implementation was just completed in 2013 no results are available, but

improvements in habitat and populations are expected. Cumulatively this restoration oriented project will occur over large areas well into the future and has the potential to have a significant, positive impact to NIDGS recovery.

The cumulative effects of foreseeable continued recreation, fuelwood gathering would have no known effects to the species. Increases in recreation activities around Lost Valley Reservoir including off road travel have the potential to negatively affect NIDGS habitat and eventual population expansion. Until further research is concluded, cumulative effects of livestock grazing are currently unknown. Presumably if forage production is improved and stocking rates remain the same, livestock distribution across the area would improve. Other ongoing and/or foreseeable future activities that could add to impacts on NIDGS within the analysis area are summarized in the DEIS, Appendix A. Fall prescribed burning would be cumulatively beneficial to NIDGS, when coupled with any other habitat management activities in the analysis area.

Determinations

Alternative A will have *No Effect on the Northern Idaho Ground Squirrel*. The action alternatives *May Effect, but are Not Likely to Adversely Affect* the species.

Effects Determinations

The Wildlife Biological Evaluation, incorporated as the base for the Wildlife Specialist Report, provides the full analysis of effects for Region 4 Sensitive wildlife species. The Wildlife Biological Assessment, also incorporated in the Specialist Report, provides the full analysis of effects for federally-listed wildlife species; all of that analysis is included in this document. A summary of those determinations is presented in Table WL-26.

Table WL-26. Summary of Effects Determinations for wildlife species analyzed for the Lost Creek–Boulder Creek Landscape Restoration Project.

Family	Common Name	Status	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Family 1	White-headed Woodpecker	S, MIS	NLCFL	BI	BI	BI	BI
Family 2	Flammulated Owl	S	NLCFL	NLCFL	NLCFL	NLCFL	NLCFL
	Great Gray Owl	S	NLCFL	NLCFL	NLCFL	NLCFL	NLCFL
	Northern Goshawk	S	NLCFL	NLCFL	NLCFL	NLCFL	NLCFL
	Pileated Woodpecker	MIS	NA	NA	NA	NA	NA
Family 3	Canada Lynx	T	NLAA	NLAA	NLAA	NLAA	NLAA
Family 5	Rocky Mountain Elk	---	---	---	---	---	---
Family 12	Northern Idaho Ground Squirrel	T	NLAA	NLAA	NLAA	NLAA	NLAA
Family 13	Bald Eagle	S	NI	NI	NI	NI	NI

Note: Status: T = ESA Threatened; C = ESA Candidate; S = Region 4 Sensitive. Determination language for T&C species: NE = No Effect; NLAA = May effect, not likely to adversely affect. Determination language for S species: NI

= No Impact; BI = Beneficial Impact; NLCFL = May impact individuals, but not likely to cause a trend to federal listing or loss of viability.

3.2.5 Irreversible and Irretrievable Commitments

There would be no irreversible or irretrievable commitments for wildlife with any of the Action Alternatives.

3.2.6 Forest Plan Consistency

All four action alternatives are consistent with the Forest Plan direction for Wildlife standards and guidelines. These action alternatives would move the current condition toward desired conditions.

3.6.7 Project Record

This EIS hereby incorporates by reference the Wildlife specialist report in the project record (40 CFR 1502.21). The report is located in the Wildlife section of the project record and contains the data, methodologies, analysis, maps, references, and technical documentation that the specialist relied upon to reach the conclusions in this EIS.

3.7 Recreation

3.7.1 Scope of the Analysis

The scope of this project, for the purposes of analyzing the effects of the proposed activities to recreation, is within the boundaries of the Lost Creek Boulder Creek Project area.

3.7.2 Desired Condition

People visiting the National Forest find opportunities for a wide spectrum of recreation experiences. Recreation facilities are managed to provide safe experiences and opportunities. Dispersed recreation sites and uses are located and conducted in an environmentally responsible manner and managed to established standards. Collaboration among users results in decisions that reduce conflicts between recreational needs and environmental needs. Local communities, partners, and volunteers are involved and benefit from their roles in providing recreational opportunities. A variety of environmentally responsible access is provided for recreation users (pp. III-61 Forest Plan).

3.7.3 Existing Condition

Developed Campgrounds and Recreation Facilities

Cold Springs Campground is the only developed campground within the project area. The campground is approximately 1 mile from Lost Valley Reservoir, and has 33 camping units and two large group reservation sites. The campground provides concrete vault restrooms, two fully accessible camp sites, water, tables and fire rings at every location, and paved pathways to access the restroom facilities. The campground is generally open from Memorial Day weekend to mid-October. Campground hosts reside at the campground during the peak season.

The Lost Valley boat launch is located on the southwest corner of Lost Valley Reservoir off Forest System Road 089. It is the main boat launch for the reservoir. The boat launch offers parking, a CXT restroom, and several picnic tables. Adams County is working on a grant to replace the existing dock at this site which is in poor condition.

Dispersed Recreation/Camping opportunities

The project area is used extensively for dispersed camping. The most popular places for camping surround the Lost Valley Reservoir along Forest System Roads 128 and 074. Campsites are located on both NFS lands and private lands. Many user routes accessing these sites are in poor condition and in need of closing and/or reconstruction. Cattle infiltrate the dispersed sites in and around the Lost Valley Reservoir and add to the sanitation issues in the sites. The sites along the main road systems are almost fully occupied during the fall hunting season. This high use prompted the Forest to designate campsites along a stretch of road in the Boulder Creek Watershed with the 2008 Smokey Boulder Road Dispersed Recreation decision. With this decision, dispersed campsites were designated and signed along the 074 road, and facilities were installed including new CXT vault restrooms, fire rings, and road graveling. Old pit restrooms remain on site until funds to complete decommissioning, removal and clean-up are available.

Within the Lost Creek Boulder Creek Project area, there are 9 existing CXT vault restrooms, and 6 remaining pit outhouses in need of removal. These pit outhouses all need to be decommissioned as they are no longer functioning. With the new restrooms installed in the Boulder Creek area along Smokey Boulder road 074, sanitation issues have improved. No new restrooms are needed in the Boulder Creek area at this time, with the exception of a potential restroom at one of the Ant Basin trailheads. There is a need for additional restrooms in the Lost Creek watershed, surrounding the Lost Valley Reservoir. Recreation technicians have found refuse and unsanitary conditions in the most heavily used dispersed sites.

In 2011, the New Meadows Ranger District hydrologist and hydrologist technician compiled a summary of current conditions at dispersed campsites located on Lost Creek and around Lost Valley Reservoir (Reference: Lost Creek Dispersed Campsite Inventory). At that time, approximately 56 dispersed sites were identified, and 45 were assessed and photographed. Within these 56 dispersed sites, approximately 80 campsites were identified. The report includes an in-depth discussion of each assessed site and photographs to accompany the text, with map point locations to show the location of the site.

Recreational use of roads

There are approximately 265 miles of open road within the project area. These include both year round open roads, and seasonally open roads. All open system roads, both year-round and seasonal within the Lost Creek Boulder Creek Project area are used extensively by recreationists going for scenic drives, dispersed camping, OHV riding, trailhead access, fishing, huckleberry picking, mushroom picking, and accessing firewood cutting areas. OHV use in the area is moderate to high on weekends and holidays, but there are not any designated OHV trails within the project area. Users are riding on existing open roads, but have also created unauthorized routes that have been pioneered in by over-enthusiastic OHV users. Figure RC-1 shows an example of many unauthorized routes within the project area. Many of these routes are in need of closure and decommissioning because they were not designed properly and are causing erosion and soil damage. OHV routes that are in the correct resource location and provide for some type of desired recreation experience could be developed.

Figure RC-1. Unauthorized road leading off the 089 road west of the reservoir.

Recreational signing within the project area is poor and in need of upgrading to better orient recreationists to the places to camp, drive and use trails.

Figure RC-2. Existing signs at the main southern entrance to Lost Valley Reservoir on Road 089.

Trails

There are approximately 36 miles of designed and maintained trails within the project area. The longest of these trails, the Rapid River Ridge trail #178 lies on the border of the project area, but will be considered inside the project for purpose of analysis. Of those 36 miles, 17.8 are 2-wheel motorized, and 18.3 are non-motorized. Non-motorized trails are used by both hikers and horse riders, with minimal mountain bike use. The most use occurs in the fall months during hunting season, with low to moderate use during the rest of the summer months.

Table RC-1. Existing designated and/or maintained trails within the project area.

Trail name	2-wheel Motorized miles	Non-motorized miles	Open road miles
Cow Camp #181		7.8	
Pollock Mountain #179		4.4	
Rapid River Ridge #178	14.6		
Lick Creek #358		2.6 (2008)	
Ant Basin South #519	0.5		
Ant Basin #324		0.95	
Indian Springs #184	2.7	2.3	
Lost Valley Trail #359 - NIDGS Interpretive Trail		0.25	
Total miles	17.8	18.3	

Trail name	2-wheel Motorized miles	Non-motorized miles	Open road miles
Miles of open road			265

There are two system trails in Lost Creek. Lick Creek Trail #358, is a non-motorized trail that accesses the Lick Creek Fire Lookout. The trail is in need of heavy trail maintenance to bring it up to standard. As it nears the lookout the trails enters the Rapid River Inventoried Roadless Area.

A new trail, Lost Creek Interpretive Trail #359 (see Figure RC-3), was constructed on an existing roadbed in the former Slaughter Gulch area. This is a ¼ mile non-motorized trail built as a road to trail conversion as a part of a past wildlife project. The trail is an interpretive trail about the life history of the Northern Idaho Ground Squirrel. This trail and trailhead were completed in 2011 using wildlife funds and grants. A CXT restroom was added in 2012 completing the project.

There is a need voiced by the horseback riding community for one-day non-motorized horse trail options in the Lost Creek area.

Located in the Upper Weiser River watershed, the Price Valley parking area was built to accommodate winter snowmobile parking. This parking facility is just inside the Forest Boundary on the 074 road. It is used primarily in the winter months, but is open year-round. The parking lot has one single vault CXT restroom facility and parking for up to 10 winter vehicles with trailers, or 15 vehicles without trailers. There are no formal summer use system trails out of this parking area, but there is a user developed that may be proposed for future development.

Figure RC-3. Installed in 2012, CXT vault restroom at the Lost Valley Interpretive Trailhead site.

Heavy trail maintenance and short re-routes to improve drainage issues are needed on all of the trails within the Boulder Creek area. Trail signs are needed at many of the trail junctions and road junctions. The Ant Basin #324 trailhead and 0.9 miles of non-motorized trail that accesses the #178 trail is seldom used and could be decommissioned. While some improvements were made to the short section of Road 50079 that access this trailhead during the Wesley fire, the road leads to a small turnaround not usable by larger horse trailers (see Figure RC-4). Improved access to the same country could be accomplished using Road 51254 to the Ant Basin South Trailhead to Trail #519. This existing trailhead is large and could accommodate multiple horse trailers if developed. Road 51254 is in need of heavy road maintenance to be usable by

passenger cars and most horse trailers. Facilities are needed at this trailhead, including a restroom, hitch rails and graveling of the parking lot to facilitate better turnarounds for horse trailers.

Figure RC-4. Existing Ant Basin #324 Trailhead.

Winter Recreation Activities

Winter recreational use in the area is low to moderate, with snowmobiling and snowshoeing occurring in the Lost Valley Reservoir area when there is sufficient snow to cover the ground. Riders park their vehicles and unload snowmobiles at several locations, including the Pine Ridge parking lot, located on private land at the Highway 95/Road 089 junction, and snowmobile into the Lost Creek project area. There is also some snowmobile use that enters the Forest from the Round Valley area, in the Boulder Creek area at the junction of Highway 95 and Road 074. There are approximately 50 miles of over-snow trail authorized for grooming within the project area under the 2013 Decision for Over-Snow Grooming on the PNF. Whether these trails are actually groomed or not will be funding dependent.

The Price Valley parking lot (as described above) accommodates snowmobiles. A groomed trail out of the Price Valley parking lot was authorized with the recent PNF over-snow decision.

3.7.4 Direct and Indirect Environmental Effects

Alternative A

Under the No Action alternative it is expected that the recreation opportunities in the project area would not change and recreation use and activities would continue as they have in the past. Open road and trail

opportunities would remain the same. Trail maintenance would be accomplished on the existing trail system as scheduled by the district trail crews. Existing trail opportunities would continue to be provided within the project area (Table RC-2).

Table RC-2. Alternative A - Existing open roads and trails within the project area.

Trail name	2-wheel motorized	Non-motorized	OHV trail	Open road miles
Cow Camp #181		7.8		
Pollock Mountain #179		4.4		
Rapid River Ridge #178	14.6			
Lick Creek #358		2.6		
Ant Basin South #519	0.5			
Ant Basin #324		0.95		
Indian Springs #184	2.7	2.3		
Lost Valley Interpretive Trail #359 - NIDGS		0.25		
Total trail miles	17.8	18.3	0	
Total open road miles				265

In Lost Creek, there would continue to be a lack of desired horse-back riding day loop opportunities. The trail to Lick Creek lookout would continue to be under maintained unless a trail improvement grant was applied for and received to improve the trail, or the district made the trail a higher priority for heavy maintenance using allocated funds. The amount of OHV use will likely continue to rise with no new trail riding opportunities provided. Unauthorized trail development would likely continue as OHV riders pioneer routes into the forest. OHV use would continue to be mixed with passenger use vehicles along open roads. In Boulder Creek the existing motorized and non-motorized trails would remain as they are today, with many identified maintenance shortfalls along the trails, but no additional funds to complete the work. Poor trail signing would continue to be a problem, as would a lack of good trailheads for horse trailer parking areas.

Motorized driving opportunities on open roads within the project area would remain at 265 miles of open road available for the recreational use to drive for pleasure, hunting access, berry and mushroom picking and other motorized pursuits.

In approximately 56 identified dispersed sites, containing about 80 dispersed campsites around and nearby Lost Valley Reservoir (located on NFS lands), sanitation would continue to be a problem because of the lack of Forest Service provided restrooms. Sanitation issues would continue at all of the dispersed sites with no new restroom facilities provided, continuing to be a health and safety issue for both the public and the recreation crews that clean the sites throughout the season. The three existing vault restrooms in the Lost Creek area are not sufficient to take care of the use occurring adjacent to the reservoir. Camping using a motorized vehicle would continue to go uncontrolled and unregulated around the reservoir, with poor access routes into the sites, no proper designated sites, no site boundaries and no site amenities, such as restrooms, tables or fire rings. The six existing old pit toilets would remain along the roadways in the Lost Valley and Boulder Creek area. Dispersed site clean-up would be completed by the recreation crews as time and funding permitted. Without any fencing, cattle would continue to enter the dispersed sites.

The roads and unauthorized routes leading into dispersed sites would continue to erode, with vehicle and RV access being difficult in many locations. Uncontrolled motorized vehicle camping would continue in

the area surrounding the reservoir. Camping using a motorized vehicle could continue to occur anywhere in the project area up to 300 feet off roads where identified as allowed on the Motor Vehicle Use Map (MVUM). Currently there are approximately 219 miles of road within the project area open to dispersed camping up to 300 feet off the road (Reference the 2013 MVUM). Approximately 46 miles of road within the project area are restricted to "camping using a motorized vehicle in designated sites only". The dispersed camping sites with erosion problems, muddy and poor access would remain open to use. Signing of the sites and recreational opportunities within the project area would continue to be inadequate for the amount of users coming into the area looking for recreation opportunities.

Alternative B

Effects from proposed Recreation Improvements:

Boulder Creek/Trails:

Improvements proposed in Alternative B to the Boulder Creek trails will improve the existing recreational use experience for both motorized and non-motorized trail users. Developing some trailhead parking will benefit trail users by providing for parking to stage out of for motorcycle riding on the motorized trails, and for hiking and horse-back riding on the non-motorized trails. Parking lot improvements proposed for the Ant Basin South #519 trailhead will benefit horse-trail riders by giving them a good location to park and turn around the large horse trailers. Proposed hitch rails and restroom will make a good staging area to begin a back-country trip. Installing missing signs on all the trails in the Boulder Creek area will benefit trail users, making it easier to find the correct trails. Trail damaged that occurred during the 2012 Wesley Fire would be repaired with this project bringing those trails back up to standard, and provide an improved recreational trail experience.

Decommissioning the Ant Basin #324 trailhead and 0.9 miles of trail #324 non-motorized trail that accesses the #178 trail, and relocating all trail use to the larger – better located Ant Basin South #519 trail, will improve access to the higher Rapid Ridge trail system, and also provide for needed parking for larger horse trailers. Decommissioning the seldom used #324 trail will save future trail maintenance dollars, and road maintenance dollars along the approximately ½ mile section of Road 50079 that would be closed to the old trailhead. Improving the road access on FS Road 51254 (which accesses the Ant Basin South trailhead and #519 motorized trail) will better facilitate access by both horse trailers and passenger cars.

Lost Creek/Trails:

Alternative B would designate approximately 20 miles of OHV trail open to all vehicles (74 inches and less) with the proper trail design features and standards using a mix of currently seasonally open and closed Level 1 Forest System roads 50980, 51056, 50076, 50977, 50976, 50974, 50012 and short sections of unauthorized routes to make loop connections. The OHV use desired and planned for during trail development will be for the typical UTV and ATV vehicles, not for passenger cars. Thirteen miles of trail have been identified to date, 6.3 using closed roads and 6.7 miles using seasonal roads (Figure RC-3, Figure 2-5). The other 7 miles of OHV trail opportunities will be identified between draft and final EIS through public comment. This trail loop network would still require the use of one seasonally open road (Forest Road 51057) to make the entire connection. However, full size vehicle use on this road is very low; therefore no safety issues are expected with dual use. Also proposed is an OHV trail connecting Cold Springs Campground with Forest Road 50974. This connection would begin between campground sites 10 and 12 and travels up to Forest Road 50976, and is approximately 300 feet in length.

The OHV trails in Alternative B would be designed to meet design parameters for four-wheel drive vehicles greater than 50 inches in width using Trail Class 2 standards (FSH 2309.18 – Trails Management Handbook, Chapter 20 – Trail Development). These standards have a design tread width of 72 – 84 inches, are on native material with limited grading, with structures minimum width being 96 inches. When designing the trailheads for these trails, efforts would be made to make sure users understand that the trails would not be maintained for passenger cars or SUVs, but only for recreational four-wheel drive vehicles, primarily UTVs and ATVs. This OHV route system would be located directly south of Lost Valley Reservoir and would provide desired trails for the numerous OHV riders that use the area. The OHV route system would encourage riders to stay off the main road system and provide opportunities to ride off-road and away from passenger car higher speed traffic. Under this alternative, the new trails would be open to a more diverse group of OHV riders, as the trails would allow for use by all vehicles 74 inches and less. This would accommodate use by UTVs and other newly designed off-road vehicles.

Table RC-3. Alternative B – Open Roads and Trails within the project area.

Trail name/number	2-wheel motorized	Non-motorized	OHV trail	Open road
Cow Camp #181		7.8		
Pollock Mountain #179		4.4		
Rapid River Ridge #178	14.6			
Lick Creek #358		2.6		
Ant Basin South #519	0.5			
Ant Basin #324		0.95		
Indian Springs #184	2.7	2.3		
Lost Valley Interpretive Trail - NIDGS #359		0.25		
New Horse Trails		0		
Road to trail conversion - New OHV trails (open to all vehicles)			13 identified to date, 20 miles proposed	
Trails decommissioned		(-) 0.95 (#324)		
Trail construction		(+) 0.5 (Pollack TH to Cow Camp)		
Total trail miles	17.8	17.8	20	
Miles of open road				255

Boulder Creek and Lost Creek/Dispersed Camping:

Numerous areas surrounding Lost Valley Reservoir are used for purposes of dispersed camping using a motorized vehicle, and are located on both NFS lands and private lands. This analysis will focus on those sites on NFS lands. The existing sites range from good condition, with no need for improvements, to poor condition with many needs for improvements. (2011 – Lost Creek Dispersed Campsite Survey, Project Record). Under Alternative B, recreational facilities including fire rings, toilets, barrier rock, road improvements, signing and information are proposed. Table RC-4 below displays the sites that are proposed for improvements, and the sites proposed for closure. Figures 2-5 shows the location and site number for each site. Adding these facilities to some of the sites will improve the overall recreation experience. With this alternative, of the 80 identified sites, approximately 68 sites will be improved, and 12 will be closed and rehabilitated back to their natural condition. While this will marginally reduce the

number of dispersed campsites by 12, the ones remaining will be in a better condition for recreation opportunities and improve resource conditions. The added restrooms will improve immeasurably the sanitation at many of these sites, which will improve the recreation experience. The sites will be more safe, sanitary and visually pleasing. There will still be multiple smaller sites available for camping on the many road systems in the project area. Only the sites immediately adjacent to Lost Valley Reservoir would be restricted to "motor vehicle use in designed sites only". Under current conditions and Alternative A, 219 miles of road is open to dispersed camping within 300 feet of the road using a motorized vehicle within the project area. Under Alternative B, this is reduced to approximately 200 miles of road. The main loop Forest Road 089 around Lost Valley Reservoir would be restricted to "camping using a motorized vehicle in designated sites only". As stated above, 68 sites will be improved and designated within this area, so there will not be a noticeable reduction in available dispersed camping sites in the project area. The designated camping applies only to camping more than one vehicle length off the road and up to 300 feet off an open road. The MVUM allows for any vehicle to pull one vehicle length off the road (where safe to do so) for purposes of berry picking, camping, and other activities.

New facilities proposed in this alternative include; six CXT single vault restrooms in the most highly used dispersed camping areas around the reservoir, up to 25 fire rings, barrier rock, designated camping signs, and three large 3-panel information sign kiosks at major road junctions. See Figure 2-5 for the proposed locations of these facilities. Adding these facilities to the Lost Creek area will improve the recreational users experience by proving vital information on the location of the new trails, and dispersed and developed campgrounds.

Table RC-4. Recommended Dispersed Campsite Improvement within Lost Creek and Restoration work by site number (reference Recreation Map x for site numbers)

Site Number	Retain and improve/close	Rationale for close or Recommended work to keep open
1	Retain	Add two fire rings, designate site with "camping allowed" sign
2	Retain	Add two fire rings, designate site with "camping allowed" sign
3	Retain	Designate site with "camping allowed" sign
4	Close	Close unauthorized OHV trail, no loss of dispersed camping
5	Retain	Add one fire ring, designate site with "camping allowed" sign
6-7	Retain	Add one fire ring, designate site with "camping allowed" sign, recommend this area for self-contained toilet units only. Install culvert at access entrance across spring-ditch.
8	Retain	Recommend this area for self-contained toilet units only. Designate site with "camping allowed" sign
9	Close	Close and rehabilitate the road into this site. Much of the site is a wetland. Block site entrance with barrier rock or logs.
10	Retain	Install CXT restroom. Add one fire ring. Designate site with "camping allowed" sign
11	Retain	Install CXT restroom. Add one fire ring. Designate site with "camping allowed" sign
12	Retain	Add fire ring and potentially barrier rock to control access to close to the reservoir. Designate site with "camping allowed" sign

Site Number	Retain and improve/close	Rationale for close or Recommended work to keep open
13	Close	Steep access road in, stream crossing, boggy area.
14-17	Retain	Retain these sites but close off multiple access routes into the site and identify main access route in, gravel the road and install two fire rings, one CXT restroom. Designate with "camping allowed" sign.
18-19	Close	Road access into wet sites 20-21.
20-21	Close	High concern stream crossing. Steep access road into the sites, poor drainage and severely impacted ford.
22	Close	Flooding occurs on a regular basis, wet and not suitable for camping. Closure may require barrier rock/logs.
23	Close	Remove camper-made outhouse. Flooding occurs on a regular basis, wet and not suitable for camping. Closure may require barrier rock.
24-25	Retain	3 sites located close together. Sites need road work, graveling, culverts installed, unauthorized routes rehabilitated. Add two fire rings, barrier rock and designated site signs.
26	Retain	Multiple sites located in this area. New CXT installed in 2012 will help to service use. Install barrier rock, close and rehabilitate multiple user trails in the area, install four fire rings, identify campsite with "designated camping allowed here" signs.
27	Close	Rehabilitate the road access,
28-30,32	Close	Steep user created sites, some are wet and erosion channels forming need repaired. Site clean-up needed to remove trash.
31	Retain	One of the sites could be retained and designed for camping, install one fire ring and barrier rocks to define the site boundaries. Encourage self- contained restroom units.
33	Retain	Block off site from riparian area using barrier rock, close unauthorized OHV tracks leaving the camp area. Designate with "camping allowed" sign.
34-35	Retain	Site needs clean-up, old weir and trash need removed. Two-three camp site available, add two fire rings, designate with "camping allowed" signs. Encourage self-contained toilet units only at this site.
36	Retain	Designate with "Camping allowed" signs. Install two fire rings. Two-three sites available.

Note – There are approximately 80 dispersed campsites within these 36 identified sites above. Some sites have multiple campsites. Of the 80 sites, 12 would be recommended for closure.

Alternative B proposes decommissioning and removing the all five no longer usable wooden pit outhouses located along Forest Road 50074 road in Boulder Creek and the one remaining near the dam of Lost Valley Reservoir. This would prevent the unintended use of these sites, and improve the sanitation of the area by no longer having them available for vandalism and/or attempted use. Visual quality in the area would also improve when these pit outhouses are no longer visible.

Installing the proposed three 3-panel entrance/information type kiosks at the main entry points to the reservoir will be a vital link to getting the desired travel management use understood by recreational users in the area. The signs will contain information on the new trails, where they are and the type of use allowed on the trails, will also display the areas for dispersed camping using a motorized vehicle, the

location of the CXT restrooms and places where self-contained toilets are recommended. The signs would be located at the FS Road 50089 junction from Highway 95, the second at the 50123 and 50943 junction, and the third at the dam along the 089 road.

Where needed on the roads with multiple access points into dispersed camping sites, one main access road into the identified dispersed sites would be signed and improved to level 2 road standards. The unneeded multiple access routes into these dispersed camping sites would be closed and rehabilitated. These improvements would also improve the resource conditions in the watershed.

Retained dispersed campsites surrounding the Lost Valley Reservoir, would be designated (with signing) and contain some barrier rock and pole fencing, to better define and delineate the boundaries of the camp sites where needed to avoid perpetual and continued growth of the camping sites/areas. The fencing would help to control unlimited cattle access into some of the more popular dispersed camp sites. Of the 80 sites identified during the Lost Creek dispersed campsite survey, 68 would remain open and be improved. Table RC-4 above describes the recommended work to be done at each site. Where installed, barrier rock would define and limit vehicle access to the reservoir high water boundary. Sites would have fire rings added to enclose camp fires and prevent multiple rock fire ring development. The Forest would also use signing to begin to educate the recreating public on the recommended use of "self-contained restroom units" while camping around Lost Valley Reservoir. This would be to try and limit the amount of unwanted refuse within the dispersed campsites that would not have a CXT installed restroom.

Existing campsites too close to the reservoir and those with poor access or near fragile riparian areas would be closed and restored to their natural condition. Twelve sites have been identified for closure and are listed above in Table RC-4, and displayed in Figure 2-5.

Effects from proposed prescribed fire:

The prescribed burning proposed in Alternative B will have no long term effect to the recreational road and trail access in the Lost Creek and Boulder Creek areas. There could be temporary safety road and trail closures during the implementation of the burning and slash piling, but that would be only for several days during the burn period. Any trails damaged by the prescribed fire treatments significantly enough to warrant additional trail maintenance will be repaired by the fire/fuels crews to required trail standards specified in the recreation PDFs section of this document.

The prescribed fire treatments proposed in Alternative B would have no measurable effect on recreational use of dispersed recreation sites. Recreational camping opportunities could be temporarily displaced during the actual burning timeframe and alter which sites recreationist may camp in during the burning, but that effect would be short-lived and be only during the burn period. Smoke and ash could also be expected during the actual burn time and, depending on the areas being burned, could affect campers sensitive to smoke. Some recreational sites would have blackened trees and ground vegetation for the first year, but would be expected to return to green grass the following season. If prescribed fire caused trails in Boulder Creek to be closed during hunting season, that would be a concern, as would closing any dispersed camping sites during hunting season when the sites are all typically full. PDFs that require the district fuels specialist to work with the district recreation specialist on the timing of the burning and notification to the public of these burns are in place.

Effects from proposed mechanical vegetative treatments:

Mechanical vegetation treatments proposed in Alternative B would affect the use of the roads and trails within the project area by the general public for the duration of the harvest. Logging trucks can cause safety issues when driving on the same roads used by the public. There would likely be more dust on the roads during the harvest operations. Some roads may be temporarily closed at certain times during the harvesting season.

Winter logging and hauling would affect the use of the groomed over-snow trail system in both the Boulder Creek and Lost Creek areas. Some PDFs have been put in place to minimize the effects, but the over-snow trail systems would be impacted during the implementation phase of the hauling of timber out of the project area.

The presence of harvest-related activities (felling, yarding, loading, road building, log hauling, planting, fuel treatments) would disturb some recreationists dispersed camping in the immediate vicinity of the harvesting, especially those seeking a more peaceful or primitive experience, and consequently disperse use to other areas. Logging slash and constructed roads would increase use by fuelwood gatherers. These impacts would be short-term (0-5 years) and seasonal in nature, primarily affecting summer and fall use.

Effects from proposed watershed Improvement and Restoration Treatments:

Roads and unauthorized routes proposed for closure, decommissioning and rehabilitation are not currently open to motorized vehicle use, so there would be no affect to existing recreational road and/or trail access within the project area.

Alternative B results in the reduction of 10 miles of available open road from the current condition of 265 miles to 255 miles. With the proposed UTV trail system adding 20 miles of motorized use, there is no net loss in motorized opportunities to the driving public, and a significant difference to available recreation opportunities is not expected. There would still be hundreds of miles available to access hunting, scenic driving, berry picking and fuelwood gathering.

There are no effects to the existing recreational dispersed camping opportunities with the implementation of the watershed treatments proposed in Alternative B.

Alternative C

Effects from proposed Recreation Improvements:

The recreation portion of this Alternative is the same as Alternative B with the following exceptions:

Trails:

Proposed OHV trails are reduced from the proposed 20 miles in Alternative B to 11 miles in Alternative C, using the routes identified in Alternative B, with reductions to remove steep sections of route. Under this alternative only the 11 miles identified to date in Figure 2-5 would be proposed. The OHV trails would be limited to “vehicles 50 inches and less in width” (more typical of current ATV trails width). The OHV trails would be designed to ATV design parameters that meet Trail Class 2 standards (FSH 2309.18 – Trails Management Handbook, Chapter 20 – Trail Development). These standards have a design tread width of 48” – 60”, are on native material with limited grading, with structures minimum width being 60 inches. When designing the trailheads for these trails, efforts would be made to make sure users understood the trails were not maintained for passenger cars or SUVs, but for recreational all-terrain vehicles.

This would offer opportunities to ATV riders, but would not afford the newer UTV type vehicle riders the opportunity to ride the newly developed OHV trails. Alternative C proposes the development of up to 20 miles of road to non-motorized trail conversion located in both the Boulder Creek and Lost Creeks. Loops would be signed and identified on the main kiosk maps. Trails would be maintained as Trail Class 1-minimally developed (FSH 2353.142, Exhibit 01) with a managed and designed use for Pack and Saddle Stock, but would also be open to mountain bikes and hiking. Approximately three miles of new trail would need to be constructed to fully connect these proposed loop routes. The proposed routes are displayed in Figures 2-4 and 2-5.

The table below displays the proposed non-motorized trail loops, and the accompanying road work proposed in all alternatives. Each alternative recommends different future uses of the roadbeds and thus offers different potential trail experiences and/or opportunities.

Table RC-5. Non-motorized Trail Loop Proposals

Name of the Loop Trail and miles	Alternative B	Alternative C	Alternative D	Alternative E
Corral Creek (7.0 mi)				
Road 50950	Haul route then LTC	Same as Alt B	Same as Alt B	Same as Alt B
Road 51159	Haul route – open road	No haul, LTC	Same as Alt B	Same as Alt B
2 miles of new construction needed to complete the loop				
Butter Gulch (3.9 mi)				
Road 50653	Haul route then LTC	Same as Alt B	Same as Alt B	Same as Alt B
Tamarack Ridge (5.3 mi)				
Road 50991	Haul route – maintain and improve	Same as Alt B	Same as Alt B	Same as Alt B
Road 50988	Haul route then LTC, decommission a portion of unauthorized road	Same as Alt B but more trail construction needed (1.3 mi)	Same as Alt B	Same as Alt B
1 miles of new construction needed to complete the loop				
Chokecherry Connector (3.8 mi)				
Road 50158	Haul route – open road	No haul - decommission	Haul – maintain and improve	No haul – maintain and improve

Name of the Loop Trail and miles	Alternative B	Alternative C	Alternative D	Alternative E
Chokecherry Short (0.7 mi) Road 50063	Haul route – open road	Haul route then decommission	Haul route – maintain and improve road	No haul – maintain and improve road

As shown in Table RC-5 above, all proposed non-motorized trail loops would be affected to varying degrees by the different road management options in each alternative.

- Chokecherry Connector route (3.8 mi) and Chokecherry Short (0.7 mi) remain an open road in all but Alternative B. These two routes could only be designated as non-motorized trail if Alternative B was selected, otherwise, the road system could be used by horse trail riders, but they would be sharing them with motor vehicles.
- Corral Creek route (7.0 mi) is only feasible as a non-motorized route under Alternative C, where both road segments are recommended for long term closure after project implementation is complete. The other alternatives had sections of the route that would remain open road making it not suitable for a non-motorized trail.
- Butter Gulch Loop (3.9 mi) could be a viable non-motorized trail opportunity in all alternatives as it would be used as a haul route for the duration of the project, then put into a LTC. Once the mechanical treatments and log hauling were completed, the road to non-trail conversion and trail signing could take place.
- Tamarack Ridge loop trails (5.3 mi) have major road segments that would remain open roads in all alternatives, so this non-motorized trail loop opportunity should be dropped from further future consideration.

Harvesting, thinning and other mechanical treatments proposed in the Alternatives would affect use of the proposed non-motorized trails for the life and duration of the implementation phase of this project. Affects would range from closing the trails at times to complete burning, harvesting, etc. Once the treatments were completed, the proposed non-motorized trails would be signed, and opened and available for use. The trails may not be fully developed until the completion of the mechanical treatments.

The difference between Alternative B and C regarding OHV opportunities is in the width of trails, which in Alternative C is limited to vehicles 50 inches or less, and the miles of trail. The reduced trail width would limit future OHV riding opportunities to the standard “ATV” type vehicles, and would not allow access or use by the UTV vehicles, which are traditionally wider. Alternative C also recommends nine miles less OHV trail be constructed, which reduces future OHV trail riding opportunities.

Alternative C provides for 224 miles of road open to the public to access recreation opportunities. This is a reduction of 41 miles of open road to public vehicle access, but the 11 miles of new ATV trails proposed would help to minimize any loss in motorized access in the watershed. This amount of open road reduction will affect the amount of available future road related recreation opportunities, including dispersed camping

using a motorized vehicle, berry and mushroom picking, fuelwood gathering, and vehicle related hunting access.

Trail Maintenance:

1. Lost Creek –heavy trail maintenance of Lick Creek Trail #358.

Table RC-6. Alternative C – Open Roads and Trails within the project area

Trail name	2-wheel motorized	Non-motorized	OHV trail	Open Road
Cow Camp #181		7.8		
Pollock Mountain #179		4.4		
Rapid River Ridge #178	14.6			
Lost Creek #358		2.6 (2008)		
Ant Basin South #519	0.5			
Ant Basin #324		0.95		
Indian Springs #184	2.7	2.3		
Lost Valley Interpretive Trail #359 - NIDGS		0.25		
New Horse Trails		20		
New OHV trails (open to vehicles 50 inches and less)			11	
Trails decommissioned		(-) 0.95 (#324)		
Trail construction		(+) 0.5 (Pollack TH to Cow Camp)		
Total trail miles	17.8	37.8	11	
Total open road miles				224

Dispersed Camping:

Currently approximately 219 miles of road within the project area are open to dispersed camping using a motorized vehicle up to 300 feet off the road. Under Alternative C, users would be limited to dispersed camp in designated sites only within the entire Lost Creek Boulder Creek Project area. Currently, only Forest Road 074 in Boulder Creek and several road segments within Lost Creek are closed to dispersed camping within 300 feet of the road using a motorized vehicle (totaling 46 miles of road). Campers would not lose dispersed camping access in these areas because the Forest would designate sites for camping in areas without resource damage concerns. The number of dispersed recreation sites available to recreationists would be lower than the present condition, but the sites remaining open would be improved from the current condition, with new added facilities (fire rings, restrooms, and improved road conditions into and out of the sites). During busy weekends this may mean some recreationists would not be able to find open campsites. It is estimated that up to 200 sites could be designated throughout the project area (this would include the 68 sites to be designated around the Lost Valley Reservoir mentioned in Alternative B). These sites have not been identified on the ground to date, but would take into account popular existing camping areas. Alternative C would require intensive management from FS recreation employees. Project area wide site designation would require additional signing, managing the signs and sites, and managing restricted use along the roadways which in turn would equal additional time and effort from Forest employees in patrolling and clean-up.

The MVUM map would be updated to reflect this change in use. This would impact the visitor primarily during hunting season when most available campsites are full of camping units housing hunters. (Note: Designating camping sites refers to camping up to 300 feet from the roadway, which is currently allowed anywhere on the MVUM with dots on the side of the road. This alternative does not restrict parking a vehicle one vehicle length off the road for purposes of camping, berry picking, etc.)

Dispersed camping in Boulder Creek under Alternative B was only regulated along Forest Road 50074 with the 2008 "Smokey Boulder Dispersed Recreation Site Improvement Project". This project designated 25 inventoried recreation sites as the only available campsites along this section of Forest Road 50074. It also placed accessible picnic tables and fire rings in some of the sites, marked each designed site with a site marker defining it as a camping site, and installed two concrete vault CXT outhouses along the corridor. Alternative C would expand the "Camping in designated sites only using a motorized vehicle" to all open roads within the project area.

Effects from proposed prescribed fire (as proposed in Alternative B) to the issue 1 and 2 for recreation):

Same as analyzed in Alternative B

Effects from proposed mechanical vegetative treatments:

The treatments proposed in Alternative C are less than in Alternative B, therefore the effects would be less, but still similar to those analyzed in Alternative B. The same PDFs would apply to both Alternatives B and C.

Effects from proposed watershed Improvement and Restoration Treatments:

There is a reduction of 41 miles of road open to the public for driving and accessing recreation opportunities. These effects are the same as those discussed above.

Alternative D

Effects from proposed Recreation Improvements:

Same as analyzed in Alternative B.

Effects from proposed prescribed fire (as proposed in Alternative B) to the issue 1 and 2 for recreation):

Same as analyzed in Alternative B

Effects from proposed mechanical vegetative treatments:

There are slightly more treatments proposed in this alternative, but the effects to recreation would be the same as analyzed in Alternative B.

Effects from proposed watershed Improvement and Restoration:

Same as Alternative B.

Alternative E

Effects from proposed Recreation Improvements:

Same as Alternative B.

Effects from proposed Alternative E Prescribed Burning:

The prescribed burning proposed in Alternative E is less than analyzed in Alternative B, and will have no long term effect to the recreational road and trail access in the Lost Creek/Boulder Creek areas.

Effects from proposed mechanical vegetative treatments:

Same as Alternative B

Effects from proposed watershed Improvement and Restoration:

Same as Alternative B.

3.7.5 Cumulative Effects

Past effects within the project area that pertain to recreation include; poor sanitation in the dispersed camping sites, road problems entering dispersed camping sites, lack of recreational signing and information and poor trail conditions, fire wood collection, prescribed burning, past mechanical treatments, Forest-wide over-snow grooming decision, livestock use within the recreation sites, and closing the area to cross-country motorized travel with the Council/New Meadows Travel Plan decision in 2009. All action alternatives would work toward improving these conditions.

3.7.6 Irreversible and Irretrievable Commitments

There are no irreversible or irretrievable commitments to the recreation resource with the implementation of any of the action alternatives.

3.7.7 Forest Plan Consistency

All recreation alternatives would be consistent with Forest Plan direction. All Recreation Action Alternatives (B and C) would meet the Forest Plan goals/objective of General Recreation (REGO03, p. lll-62: Address current and emerging recreation conflicts, while maintaining recreation opportunities when possible".

3.7.8 Project Record

This DEIS hereby incorporates by reference the Recreation specialist report in the project record (40 CFR 1502.21). The report is located in the Recreation section of the project record and contains the data, methodologies, analysis, maps, references, and technical documentation that the specialist relied upon to reach the conclusions in this DEIS.

3.8 Transportation

Introduction

The amount of roads and how the road system is managed in the Lost Creek-Boulder Creek Project area is a concern. Roads are used to provide access to the Forest for both the public and resource management. Roads may affect other resources such as wildlife, soil and water, fisheries, range, and recreation.

3.8.1 Scope of analysis

The analysis area for transportation is the Lost Creek-Boulder Creek Project area.

3.8.2 Desired Condition

Forest Plan Direction

The Payette National Forest Land and Resource Management Plan (Forest Plan), completed in July of 2003 has the following direction and guidance for Roads.

The road network matches the level of management activities occurring on the Forest and supplies the transportation system needed for recreation, special uses, timber harvest, range management, minerals development, fuels reduction, and fire protection. The transportation network is managed, through the use of a variety of tools, to reduce degrading effects to resources. Roads needed for long-term objectives are maintained to provide for user safety and resource protection. Roads not needed for long-term objectives are decommissioned and stabilized (FP III-58).

Table T-1. Forest Wide Goals, Objectives, Standards, and Guidelines for Roads (FP III-58 to 60)

Management Direction for Roads		
Type	**Number**	**Direction Description**
Goals	FRGO01	Provide and maintain a safe, efficient Forest transportation system that meets resource management and access needs, while mitigating degrading resource effects.
Objectives	FROB01	Analyze road system needs and associated resource effects in accordance with the established agency policy direction for roads analysis.
	FROB02	Cooperate with federal, state, and county agencies, tribal governments, and cost-share partners to achieve consistency in road design, operation, and maintenance needed to attain resource goals.
	FROB03	Identify safety hazards on Forest classified roads, establish improvement priorities, correct or mitigate the hazard.
	FROB04	During fine-scale analyses, identify opportunities to reduce road-related degrading effects to help achieve other resource objectives.
Objectives	FROB05	Coordinate transportation systems, management, and decommissioning with other federal, state and county agencies, tribal governments, permittees, contractors, cost-share cooperators, and the public to develop a shared transportation system serving the needs of all parties to the extent possible.
	FROB06	Identify roads and facilities that are not needed for land and resource management, and evaluate for disposal or decommissioning.
	FROB10	Inventory and assess existing classified road crossings in subwatersheds that are occupied or contain critical habitat for TEPC species. Prioritize inventories and assessments in

Management Direction for Roads		
Type	**Number**	**Direction Description**
		subwatersheds outside designated and recommended wilderness and Inventoried Roadless Areas (IRA); few if any classified road crossings exist in these areas. Assess crossings to determine if they provide for fish passage, 100 year flood flow, and bedload and debris transport. Incorporate the results into the biennial updates of the Watershed and Aquatic Recovery Strategy (WARS) database.
	FROB11	In the Forest's annual program of work, prioritize and schedule improvements to existing culverts, bridges, and other stream crossings to accommodate fish passage, 100 year flood flow, and bedload and debris transport. Include accomplishments in the biennial update of the Watershed and Aquatic Recovery Strategy (WARS) database.
	FROB12	During fine-scale analyses in areas where roads and facilities are identified as a potential concern or problem contributing to degradation of water quality, aquatic species or occupied sensitive or Watch plant habitat, evaluate and document where the contributing facilities are and prioritize opportunities to mitigate effects.
Standards	FRST01	When taking water from fish-bearing streams for road construction and maintenance activities, intake hoses shall be screened with the appropriate mesh size.
	FRST02	To accommodate floods, including associated bedload and debris, new culverts, replacement culverts, and other stream crossings shall be designed to accommodate a 100-year flood recurrence interval unless site-specific analysis using calculated risk tools or another method, determines a more appropriate recurrence interval.
	FRST03	In support of road management decisions, use an interdisciplinary science-based roads analysis process such as Roads Analysis: Informing Decisions About Managing the National Forest Transportation System (USDA Forest Service, 1999 Report FS-643).
	FRST04	Roads shall be constructed to a standard appropriate to their intended use, considering safety and concerns for resource degradation.
	FRST05	Mitigate handling of road waste material (e.g., slough, rocks) to avoid or minimize delivery of waste material to streams that would result in degradation of soil, water, riparian and aquatic resources.
Guidelines	FRGU01	To protect soil, water, and riparian resources, and their occupied habitat, water supply points, service areas, and other needs for road and facility construction projects should be specified in project planning and used in project implementation.
	FRGU02	In areas of existing extensive infestation, mitigation for noxious weed prevention should be incorporated into road layout, design, and project alternative evaluation.
	FRGU03	Prior to decommissioning roads, opportunities related to those roads for potential development or use as travel routes for ATVs, mountain bikes, or other alternative forms of transportation, should be considered.
	FRGU04	Roads that are not desired for public access or tribal uses, and that are no longer needed to manage the Forest or to provide access to inholdings should be considered for decommissioning and returning the lands that they occupy to desired resource management.
	FRGU05	Where practical alternatives exist, roads in RCAs that are degrading riparian-dependent resources should be evaluated for obliteration or relocation.
	FRGU06	New roads and landings should be located out of RCAs wherever possible. When new roads or landings must be located in RCAs, they should be developed such that degrading effects to RCAs are mitigated.
	FRGU07	Annually prioritize roads to receive maintenance, repairs, or improvements to protect the investment, maintain the intended serviceability, and protect other resources. Road maintenance activities should be prioritized using factors such as user safety, resource protection needs, administrative needs, user comfort, the identified traffic service level, and available funding.

Management Direction for Roads		
Type	**Number**	**Direction Description**
	FRGU08	Classified roads in intermittent use status should be evaluated for physical closure during periods of non-use and closed as appropriate.
	FRGU09	Travel management should be used, as needed, to accomplish the following: a) Provide for the safety and welfare of the users. b) Protect threatened and endangered species and their habitat. c) Protect Forest resources, such as wildlife, soil, vegetation, and water. d) Provide a diversity of recreational experiences and reduce user conflicts. e) Protect road and trail investments. f) Comply with Forest contracts or permits, cooperative agreements, road purchase agreements, easement deeds, or other formal documents of the Government requiring that road use be controlled. g) Coordinate hunting and fishing opportunities with State agencies.
	FRGU10	When considering closure or decommissioning of roads for which an RS2477 assertion has been made by either a State or a County government, the merits of the assertion should be evaluated prior to taking any actions.
	FRGU11	Where opportunities to mitigate road management practices causing degradation have been identified, consider mitigating through measures such as relocation, closure, and changes in management strategy, alteration, or discontinuance.

The Lost-Creek Boulder Creek Project is within Forest plan Management Area 3 (Weiser River), Management Area 4 (Rapid River), and Management Area 5 (Middle Little Salmon River).

Management Areas 3, 4 and 5 have the additional management direction in the form of Road Guideline 0311(FP III-130), 0426(FP III-148), and 0514(FP III-0514);

Road construction or reconstruction may occur where needed:

- To provide access related to reserved or outstanding rights, or
- To respond to statute or treaty, or
- To achieve restoration and maintenance objectives for vegetation, water quality, aquatic habitat, or terrestrial habitat, or
- To support management actions taken to reduce wildfire risks in wildland-urban interface areas; or
- To meet access and travel management objectives.

Management Areas 4 and 5 have the additional management direction in the form of Road Standards 0424 (FP III-147) and 0510 (FP III-159);

There shall be no net increase in road densities in the MPC 5.1 portion of the Lower Boulder Creek subwatershed unless it can be demonstrated though project level NEPA analysis and related Biological Assessment that:

- For resources that are within their range of desired conditions, the increase in road densities shall not result in degradation to those resources unless outweighed by demonstrable short- or long-term benefits to those resource conditions; and
- For resources that are already in a degraded conditions, the increase in road densities shall not further degrade or retard attainment of desired resource conditions unless outweighed by demonstrable short- or long -term benefits to those resource conditions; and
- Adverse effects to TEPC species or their habitat are avoided unless outweighed by demonstrable short- or long –term benefits to those TEPC species or their habitat.

An exception to this standard is where additional roads are required to respond to reserved or outstanding rights, statute or treaty, or respond to emergency situations (e.g., wildfires threatening life or property, or search and rescue operations) (Road Standards 0425 (FP III-148) and 0511 (FP III-160)).

New roads and landings shall be located outside of RCAs in the MPC 5.1 portion of the Boulder Creek subwatershed unless it can be demonstrated though project level NEPA analysis and related Biological Assessment that:

- For resources that are within their range of desired conditions, the increase in road densities shall not result in degradation to those resources unless outweighed by demonstrable short- or long-term benefits to those resource conditions; and
- For resources that are already in a degraded conditions, the increase in road densities shall not further degrade or retard attainment of desired resource conditions unless outweighed by demonstrable short- or long -term benefits to those resource conditions; and
- Adverse effects to TEPC species or their habitat are avoided unless outweighed by demonstrable short- or long –term benefits to those TEPC species or their habitat.

An exception to this standard is where additional roads are required to respond to reserved or outstanding rights, statute or treaty, or respond to emergency situations (e.g., wildfires threatening life or property, or search and rescue operations).

Management Area 5 has the specific Forest Plan Objective 0550 (FP III-163) to: “ Improve Road 079 from Yantis Ditch to Ant Basin Trailhead (Trail 519) to provide improved access for existing recreation use.” The road was improved during the summer of 2012; additional improvements would benefit the first 0.2 miles.

3.8.3 Existing Condition

The road system in the Lost Creek-Boulder Creek Project area was primarily developed for access for harvesting timber. The majority of the road system was constructed within the last 60 to 70 years, with most of the activity occurring in 1950’s, 1960’s and 1970’s. The main access routes into the area include Smokey Boulder Road (FSR 50074), Lost Valley Reservoir Road (FSR 50089), and West Fork Weiser River Road (FSR 50127). These roads are single lane to a lane and a half with crushed aggregate surfaces. The area contains about 640 miles of road of which 473 miles are National Forest System Road (NFSR) and 167 miles of identified unauthorized roads. Additional unclassified roads exist within the area but have not been mapped. System roads have been identified as being needed for the protection, administration, and utilization of the National Forest and the use and development of its resources. Unauthorized roads are

defined as any road on FS lands that is not a system road. Most of the unauthorized road in the Lost Creek-Boulder Creek Project area are the result of past timber harvest, primarily in the 1950's and 1960's. Currently 134 miles of system road (28 percent) are managed as closed. There are approximately 265 miles of open or seasonally open system roads in the project area. Refer to the Recreation section for effects of the alternatives on road access for the public.

3.8.4 Direct and Indirect Effects

Road Actions

The following table displays what actions by alternative will take place on the ground to roads in the project area in support of harvesting Bio-mass and Saw Timber. Routine road maintenance would occur on other roads that are not connected to the proposed harvest or the project.

Table T-2. Road Actions in support of Timber and Bio-mass Harvest

		Miles by Alternative			
		Alt. B	Alt. C	Alt. D	Alt. E
Temporary Roads	New Construction	12.1	5.8	14.0	8.2
	Use and Obliterate	17.3	5.6	17.0	6.9
System Roads	Use/ Decommission	31.8	54.5	43.0	29.3
	Decommission	37.0	77.6	25.8	22.1
	Open and Improve	3.3	0	3.6	1.6
	Open/Use/Reclose	64.0	32.9	68.5	62.5
	Maintain or Improve	224.4	185.8	278.7	265.3
	Use/Close	48.4	41.3	7.4	12.7
	Gravel	26.9	19.8	34.4	31.2

Alternative A is not displayed in the table as no project related road work would occur in the no- action alternative. However yearly road maintenance would occur in the project area not connected to the project.

Temporary roads would be constructed to units where additional road access is needed for harvesting. Existing unclassified roads identified for access to harvest units would be used then obliterated. Alternative D has the most mileage of temporary roads since it has the highest level of harvest. Alternative C has the least amount of temporary road, since it has the least amount of harvest.

Road obliteration is a decommissioning technique used to eliminate the functional characteristics of a travelway and reestablish the natural resource production capability. The intent is to make the corridor unusable as a road or a trail and stabilize it against soil loss, which can involve re-contouring and restoring natural slopes (FP GL-32). Refer to the soils, hydrology, wildlife, and fisheries sections for further information on the effects and need for road obliteration. There are two categories of road obliteration designed in the Lost Creek-Boulder Creek Project. One category is to use the existing road for timber harvest and then obliterate after use. This is much like a temporary road except there is already a road bed so no road construction is involved. The other category is to obliterate the road without using it. System Roads identified for decommissioning contain two categories; those that would be used prior to decommissioning and those that would be decommissioned without be used for harvest. Alternative C has

the highest level of system road decommissioning, while Alternative E has the least amount of road decommissioning. Decommissioning would remove the road from the Forest's transportation system. It would then be determined whether or not all drainage structures would be removed and if the road would be re-contoured to slope.

Roads that are scheduled for open and improve are presently closed. The roads would be opened and improved and remain open for public use. Improvements to the roads would consist of removing brush, reshaping the surface, and installing and/or replacing drainage features where needed. The overall objective would be to make the road as self-maintaining as possible while reducing impacts to other resources.

System roads that are presently closed that would be used for harvest activities and re-closed are identified. These roads would be opened, brushed out, surfaces reshaped for use and drainage structures installed where needed. Replacement of existing culverts generally would not occur since the culverts would be pulled upon re-closing the road. Alternatives B, D, and E have similar amounts in this category while Alternative C has less since the alternative emphasizes more decommissioning of system road rather than closures.

The category of maintain or improve includes system roads that are to remain drivable after completion of the project activities. Work on these road would be classified as maintenance, and would replace or improve drainage structures, remove encroaching brush, replace surfacing where needed, add drainage features such as armored dips, spot gravel, and reshape road surfaces where needed. The main gravel roads would be maintained for passenger car use, while secondary roads would be maintained for high clearance vehicle use and designed to make the road as self-maintaining as possible while reducing impacts to other resources. Alternatives D and E have the highest mileage of maintain or improve and the least mileage of roads in the use and close category.

Gravel is proposed for stream crossings or where road are within the RCA buffers. This would occur on roads that are to remain open to vehicle use. Alternatives D and E have the greater amount of gravel mileage.

Road to trail conversion is proposed in all of the alternatives. The system roads would remain on the system but be managed as an OHV trail during periods of non-use for resource management. Alternatives B, D, and E would close 6.7 miles of seasonally open roads to full size motor vehicles but would remain for OHVs. Alternative C would close 5 miles of seasonally open roads to full size motor vehicles but would remain for OHVs. Alternatives B, C, D, and E would use 6.3 miles of closed roads for OHV trails. Refer to the recreation section for more information on road to trail conversion.

Aquatic Organism Passage

The Forest has been restoring fish passage as part of annual Forest wide maintenance activities when funds are available and sites are selected on a forest priority basis. Over the past 15 years, fish passage has been restored in Boulder Creek drainage on six stream crossings on the Smokey Boulder Road #50074.

Culvert crossings barriers have been identified for restoring fish passage as part of the project design (see Chapter 2 and Fisheries Resource section of Chapter 3).

Road Access for Management

Proposed activities to the road system (i.e. road closures and decommissioning) may reduce the amount of access to the areas identified in the Forest Plan for active management. Road access is needed for economical active management activities, including timber and biomass harvest, thinning, and fuels treatments. The public has identified access as an issue to be evaluated.

Roads are needed to transport goods and services to and from the Forest. Economical harvest of saw logs and biomass requires roads within a reasonable distance for ground based and skyline logging. Helicopter logging requires much less road but is usually uneconomical especially for thinning and biomass removal.

Acreage of suited timber land within ¼ mile of a system road was used to evaluate the level of access provided for economic harvest of saw logs and biomass. Logging systems vary by terrain. Ground based skidding is primarily downhill on ground slopes less than 45 percent, with maximum skidding distances of 800 ft. to 2500 ft. Sometimes skidding distances of 3500 feet and over occur but not that often due to terrain constraints and juxtaposition of the land. Skyline logging is uphill to roads usually on slopes greater than 45 percent. Skyline line logging is dependent on terrain, as it requires the slope beneath the skyline to be a concave shape in order to have deflection, which provides lift so the logs can be suspended while yarding. Typical yarding distance for skyline logging on the Forest is between 800 to 1,500 ft. with some distances up to 2,500 ft.

The suitable timber lands within ¼ mile from an existing road was used as an approximation to account for terrain variability The Lost Creek-Boulder Creek area has an estimated 52,255 acres of land within the suited timber base. Currently 49,830 acres or 95 percent is within ¼ mile of an existing system road. Given the past intensive timber harvest in the area in the 1950's through the 1980's then 95 percent accessed is a reasonable estimate of the current condition. It is assumed that decreases in acreage of suited timber base within ¼ mile of a road will increase the need for new road construction or temporary road construction in order to economically manage the suited timber base.

The following table shows the changes to suited timber land within ¼ mile of a system road. Alternatives B, D, and E are similar and show decreases of less than 1,000 acres or less than 2 percent. Alternative C with the emphasis of decommissioning additional system roads has a decrease of 5,549 acres or a reduction of just over 11 percent.

Table T-3. Suited Timber Lands within ¼ mile of a System Road (includes closed roads)

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Acres	49,830	48,888	44,281	48,898	49,054
Change in Acres	0	-942	-5,549	-932	-776
% Change	0.0%	-1.9%	-11.1%	-1.9%	-1.6%

Open roads are needed for access for management activities including; non-commercial thinning, fuels treatments, firewood gathering, controlled burning, and fire suppression. Generally the closer these activities are to drivable road the less they cost. Reconstructing roads that are in long term closure would require installing culverts and removing barriers in order to provide access for non-commercial thinning, fuels reductions, controlled burning, firewood gathering, and fire suppression usually does not occur unless in conjunction with commercial harvest activities. Table T-4 displays the suited timberlands within ¼ mile

of an open system road. Alternative A (no action) has no reduction in access. Alternatives D and E have reduce access by 1,285 and 1,645 acres. Alternatives B with the conversion of Administrative access only roads to long term closures reduce access by 5,600 acres or a reduction of 12.5 percent. Alternative C has the largest reduction of 8,862 acres or a reduction of 19.6 percent in access due to increased decommissioning and closing administrative use only roads.

Table T-4. Suited Timber Lands within ¼ mile of Open System Road (includes Administrative use only roads)

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Acres	45,125	39,525	36,263	43,840	43,480
Change in Acres	0	-5,600	-8,862	-1,285	-1,645
% Change	0.0%	-12.4%	-19.6%	-2.8%	-3.6%

Road Graveling and Gravel Pits

All alternatives propose graveling as well as spot graveling where needed on roads to be used for hauling logs or bio-mass. Alternative D has the most miles of graveling , followed by Alternatives E, B, and C (see Table T-2). Spot graveling would be done to armor drivable dips, stabilize soft spots, and armoring road surfaces at stream crossing. The sources for the gravel are from existing gravel pits adjacent to or within the project area. Descriptions of the gravel pits and their locations can be found in Appendix D.

3.8.7 Forest Plan Consistency

The action alternatives are consistent with Forest Plan direction for transportation.

3.9 Economics Analysis

3.9.1 Scope of the Analysis

The Lost Creek-Boulder Creek Project area is within the boundaries of the New Meadows Ranger District in Adams County, Idaho. While the project area is located in Adams County, economic linkages between the project area and neighboring communities in Idaho and Valley counties exist. When considering economics, the relevant study area for the project encompasses all of Adams, Idaho, and Valley counties and includes a number of incorporated and unincorporated communities in the vicinity of proposed treatments.

3.9.2 Affected Environment

Existing social and economic conditions are necessary to establish the baseline from which to estimate potential consequences of the Lost Creek-Boulder Creek Project. This section analyzes the current conditions and trends related to the social and economic environment of the planning area, including population and demographic changes, potential environmental justice populations, and employment and income conditions.

Population and Demographics

Population is an important consideration in managing natural resources. In particular, population structure (size, composition, density, etc.) and population dynamics (how the structure changes over time) are essential to describing the consequences of forest management on the social environment (Seesholtz et al. 2004). This section highlights population and demographic trends in the relevant study area.

Population Growth

Population growth can fluctuate considerably over time and across geographic regions. Table EC-1 shows historic population counts for the counties, state, and nation in 1990, 2000, and 2010, and growth rates for these regions between 1990 and 2010. Over the last two decades Idaho's population has grown almost twice as fast as the general population of the United States. Relative to the state, the three-county study area experienced moderate growth during the 1990's which began to slow during the early 2000's. In 2010 there were approximately 30,105 people living within the three-county Lost Creek-Boulder Creek Restoration Project study area (U.S. Census Bureau 2010). While the counties in the study area experienced considerable growth over the last thirty years, the rate at which communities within Adams, Idaho and Valley counties grew varied. In the 1990's Idaho's Valley County grew more rapidly (25 percent) than Adams (7 percent) and Idaho (13 percent) counties. By the early 2000's growth in Idaho County tapered off to 5 percent while Adams and Valley counties experienced 14 percent and 29 percent growth respectively (U.S. Census 2010).

Changes in a region's population can be attributed in part to natural increases (births minus deaths) and in part to net migration, or the number of people moving in or out, which can affect the availability of housing, services, and jobs. Amenities (the natural, cultural, and social characteristics of an area) have played an increasing role in U.S. migration. Areas characterized as having high levels of natural amenities (unique land and water features, mild temperatures, scenic quality, and recreation opportunities of a

geographic region) have been shown to experience greater population growth than areas with fewer natural amenities (Rudzitis and Johansen 1991, Johnson and Beale 1994, Beale and Johnson 1998, McGranahan1999, Hunter et. al 1999, Frentz et. al 2004), and this growth occurs increasingly at the boundaries of public lands (Hansen et. al 1998, Radeloff et. al 2001). In recent years communities surrounding National Forest lands have become increasingly attractive to many Americans because of their proximity to open spaces and natural settings which provide residents with easy access to recreational opportunities year round.

Table EC-1. Historic Population Counts and Growth Rates: 1990, 2000, and, 2010

	1990	***2000***	***% Growth, 1990-2000***	***2010***	***% Growth, 2000-2010***
United States	248,709,873	281,421,906	13%	308,745, 538	10%
Idaho	1,006,749	1,293,953	29%	1,567,58	21%
Study Area	**23,146**	**26,638**	**15%**	**30,105**	**13%**
Adams County	3,254	3,476	7%	3,976	14%
Idaho County	13,783	15,511	13%	16,267	5%
Valley County	6,109	7,651	25%	9,862	29%

Source: U.S. Census Bureau, 1990, 2000, and 2010

Population Density

Population density measures the number of people living per square mile within a given area. This measure can serve as a valuable indicator of the socioeconomic and living conditions of a region, including urbanization, availability of open space, socioeconomic diversity, and civic infrastructure (Horne and Haynes 1999). In general, more densely populated areas tend to be more urban, diverse, and offer more access to public infrastructure. In contrast, less densely populated areas provide greater access to open spaces and wildlands, which may offer natural amenity values to residents and visitors. Table EC-2 displays the number of people per square mile at the county, state, and national levels (U.S. Census Bureau 2010).

In general population densities across Idaho remain low relative to the nation. Although the study area experienced considerable growth over the last thirty years, communities surrounding the Payette National Forest continue to have very low population densities. In 2010 there were reportedly 2.9 people per square in Adams County, 2.7 in Valley and 1.9 in Idaho County. Low population densities suggest that the area is very rural and may have low levels of private land ownership. The majority of land in the three study area counties is publicly owned, with 64 percent of land in Adams, 83 percent of Idaho County, and approximately 86 percent of Valley County under federal ownership (U.S. Geological Survey, 2012). The close proximity of communities in the study area to federally owned lands makes them more susceptible to changes in resources management on public lands.

Table EC-2. Population Density

	People per Sq. Mile
United States	86.6
Idaho	19.0
Adams County	2.9
Idaho County	1.9
Valley County	2.7

Source: U.S. Census Bureau 2010, Table DP-1

Age

A population's age may affect community values and uses associated with Forest lands, making it relevant to Forest management decisions. In 2010 the median age in the United States was estimated to be 37.2 and 34.5 in Idaho (U.S. Census Bureau 2010). In general, Idaho's population is slightly younger than the general U.S. population while populations surrounding the Lost Creek-Boulder Creek Restoration Project area tend to be considerably older than the general population.

The median age of residents living in proximity to the project area is late 40's, 49.1 in Adams County, 47.6 in Idaho County, and 46.9 in Valley County (Table EC-3). A high median age is generally an indicator that an area has a relatively large number of retirees. Large populations of retirees may influence the relationships local communities have with forest resources in the project area. In general, older forest users have a higher demand for leisurely recreational experiences that provide access to facilities and a smaller share of their personal income comes from wages in forest related industries. This makes communities with a high level of retirees less vulnerable to changes in resource management on the forest.

Table EC-3. Median Age

	Median Age
United States	37.2
Idaho	34.5
Adams County	49.1
Idaho County	47.6
Valley County	46.9

Source: U.S. Census Bureau 2010

Educational Attainment

Educational attainment measures the number of people within a region who have earned a high school diploma or bachelor's degree. Levels of education can be an important indicator of the social and economic opportunities and ability of an area to adapt to change. Table EC-4 lists the percentage of the adult population with at least a high school diploma and a bachelor's degree.

Table EC-4. Educational Attainment, Percent of Persons 25+

	High School Graduate (%)	*Bachelor's Degree or Higher (%)*
United States	85.6	28.2
Idaho	88.5	24.6
Adams County	86.2	19.5
Idaho County	87.8	13.9
Valley County	93.5	36.8

Source: U.S. Census Bureau 2010, Table DP02

The majority of adults in the United States have obtained at least a high school diploma and approximately 28 percent of Americans possess a bachelor's degree of higher. While the high school attainment rate for Idaho is slightly higher than that of the country, Idaho's attainment rate for post-secondary education is lower than the national rate. Approximately 89 percent of the state's residents have earned a high school diploma and nearly a 25 percent have earned a bachelor's degree or higher. Educational attainment within the project study area tends to be low relative to the state, with the exception of Valley County (see Table EC-4).

In 2010 it was estimated that 86 percent of Adams County residents and approximately 88 percent of Idaho County residents had completed high school, with only 20 percent and 14 percent of residents in these respective counties possessing degrees equivalent to a bachelors or higher. Low educational attainment in rural areas is not uncommon. Since rural communities generally offer few opportunities for educational or occupational advancement they often struggle to retain and attract educated and highly skilled individuals. Frequently residents interested in pursuing advanced education move from these rural communities to more economically advanced areas which support greater educational opportunities.

Educational attainment of residents in Valley County is reported to be high relative to rates at the state and national level. In 2010 approximately 93 percent of people 25 years or older held a high school diploma and nearly 37 percent had obtained a bachelor's degree or higher. High levels of educational attainment may be a result of increased amenity migration. Often, new migrants to rural regions do not follow traditional economic theories of migration, have higher incomes, more education, occupations that are nontraditional by rural standards, and are not seeking socioeconomic gains (Rudzitis, 1999; Shumway, 1997; Shumway and Davis, 1996).

Economic Conditions

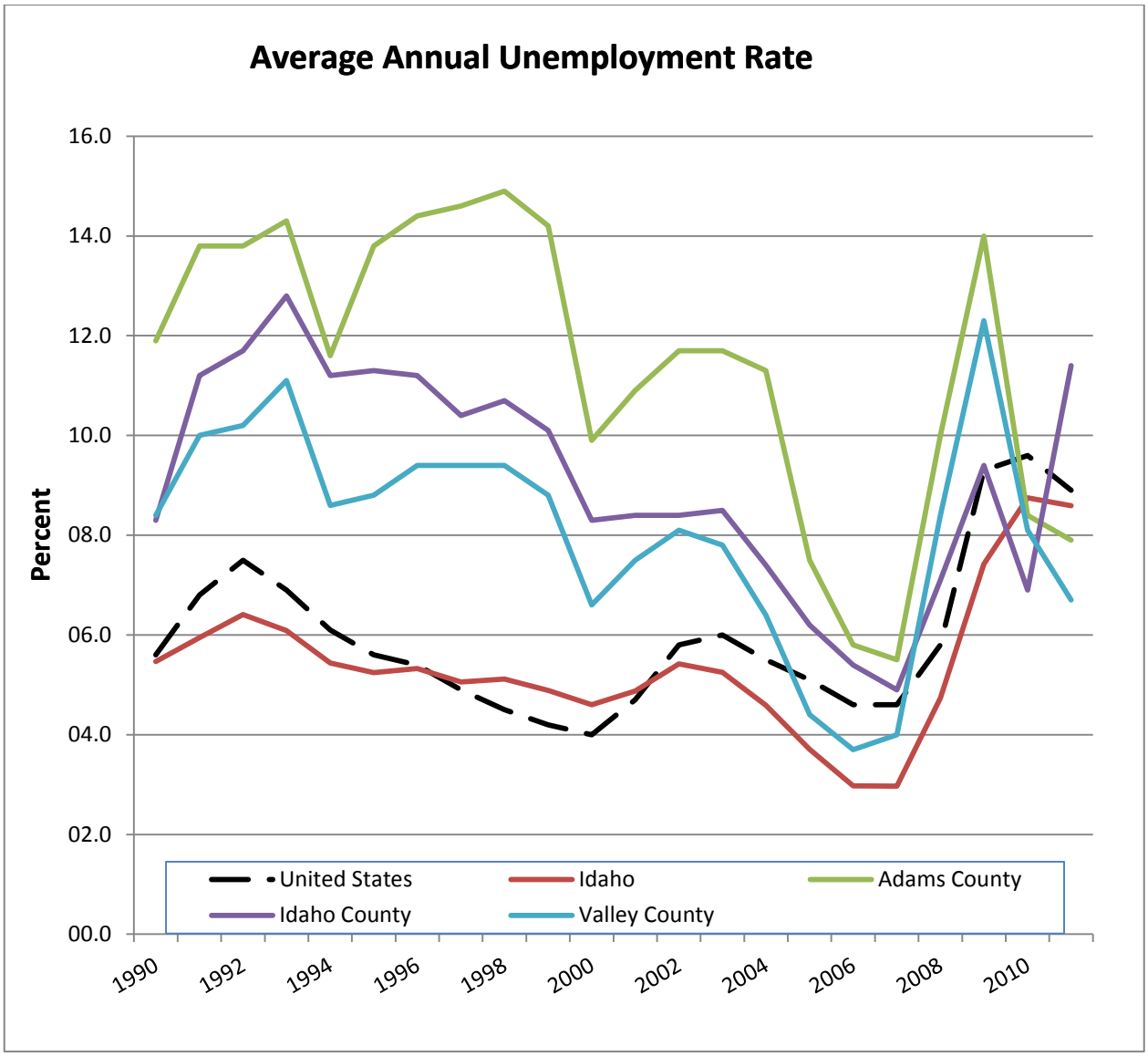
The previous section discussed demographics and population trends in counties surrounding the Lost Creek-Boulder Creek Project area relative to the state and nation. The following section will focus on economic conditions within the study area to further develop a baseline on which potential impacts can be measured against.

Unemployment

Unemployment rates measure the percent of the local work force that is jobless but actively seeking employment. Though public officials strive for full-employment, structural unemployment (mismatch between labor skills and available jobs within a region) and frictional unemployment (people moving or transitioning employment) cause rates to persist even in times of economic prosperity. The existence of structural and frictional unemployment implies that there is an inherent "natural" rate of unemployment. The natural rate of unemployment is believed to fall somewhere between 5 and 6 percent and allows

workers to move between jobs and industries without signaling broad economic distress. Figure EC-1 shows annual unemployment rate of the study area relative to the state and nation between 1990 and 2011.

Although the average annual unemployment rate for the state has generally mirrored that of the country, unemployment in Adams, Idaho and Valley counties has historically been higher than that for the state and the country. While recent trends in Idaho County's annual average unemployment rate show a gradual convergence with state and national rates, average annual unemployment in Adams and Valley counties remain high relative to other reference areas. In general, trends at the county level show greater variation in annual unemployment rates than those for the state and country. Considerable variation in annual rates suggests that these counties may be more vulnerable to changes in the economic climate.



Source: U.S. Bureau of Labor Statistics, 2012Note: Unemployment rates are not seasonally adjusted

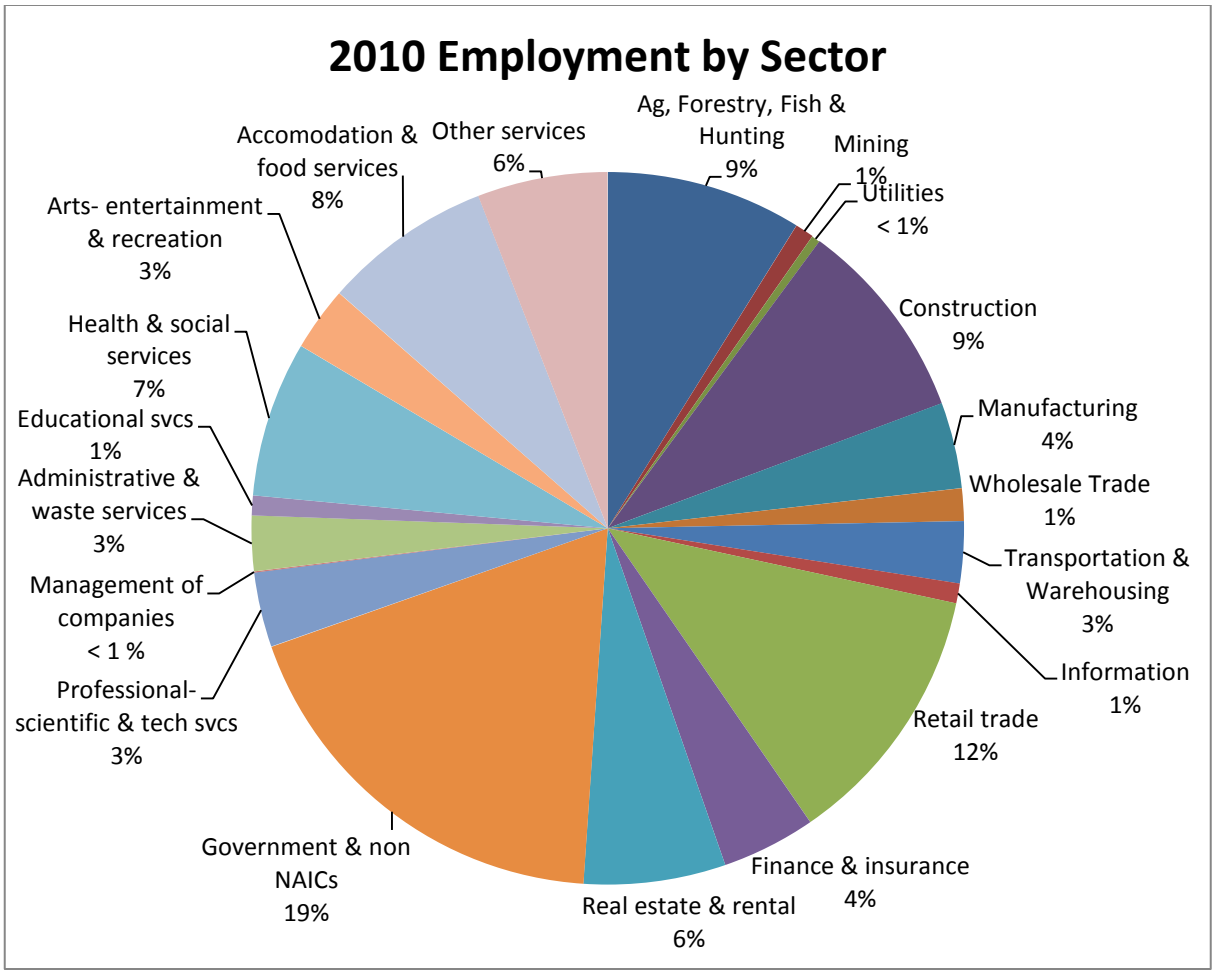
Figure EC-1. Average Annual Unemployment, 1990-2011

Employment and Specialization

Employment can generally be classified as being either Services related or Non-services related. Services related sectors support jobs in Utilities, Wholesale Trade, Retail Trade, Transportation & Warehousing Information, Finance & Insurance, Real Estate & Rental & Leasing, Professional, Scientific, & Tech., Mgmt. of Companies & Enterprises, Administrative & Support Services, Educational Services, Health Care & Social Assistance, Arts, Entertainment, & Recreation, Accommodation & Food Services, and Other Services sectors. Employment in non-services related sectors include Mining, Construction, Manufacturing, and Agriculture, Forestry, Fishing, and Hunting jobs.

Between 1998 and 2011 total employment in the three-county study area increased from 5,583 to 6,243 jobs. Though job creation is perceived as desirable, much of this growth can be attributed to growth in Services related industries which generally pay lower wages than those in Non-services sectors. Study area jobs in Service related sectors paid on annual average approximately $6,000 less than jobs in Non-services related fields (Bureau of Labor Statistics, 2012). Between 1998 and 2011 employment in Non-services related sectors declined by 10 percent while employment in Services related sectors increased by 16 percent. In 1998 Services related sectors supported 73 percent of regional employment, with Services related employment growing to nearly 78 percent of total employment in Adams, Idaho and Valley counties (EPS-HDT 2012). Although increases in Services related employment relative to Non-services employment may have a negative effect on wages in the region, employment in the Service sector may play an important role in increasing labor participation of the area's minority or underserved populations. In general, Services related sectors provide greater employment opportunities for women and minority racial groups than industries in the Non-service sector, which may have a positive effect on the social and economic well-being of these communities.

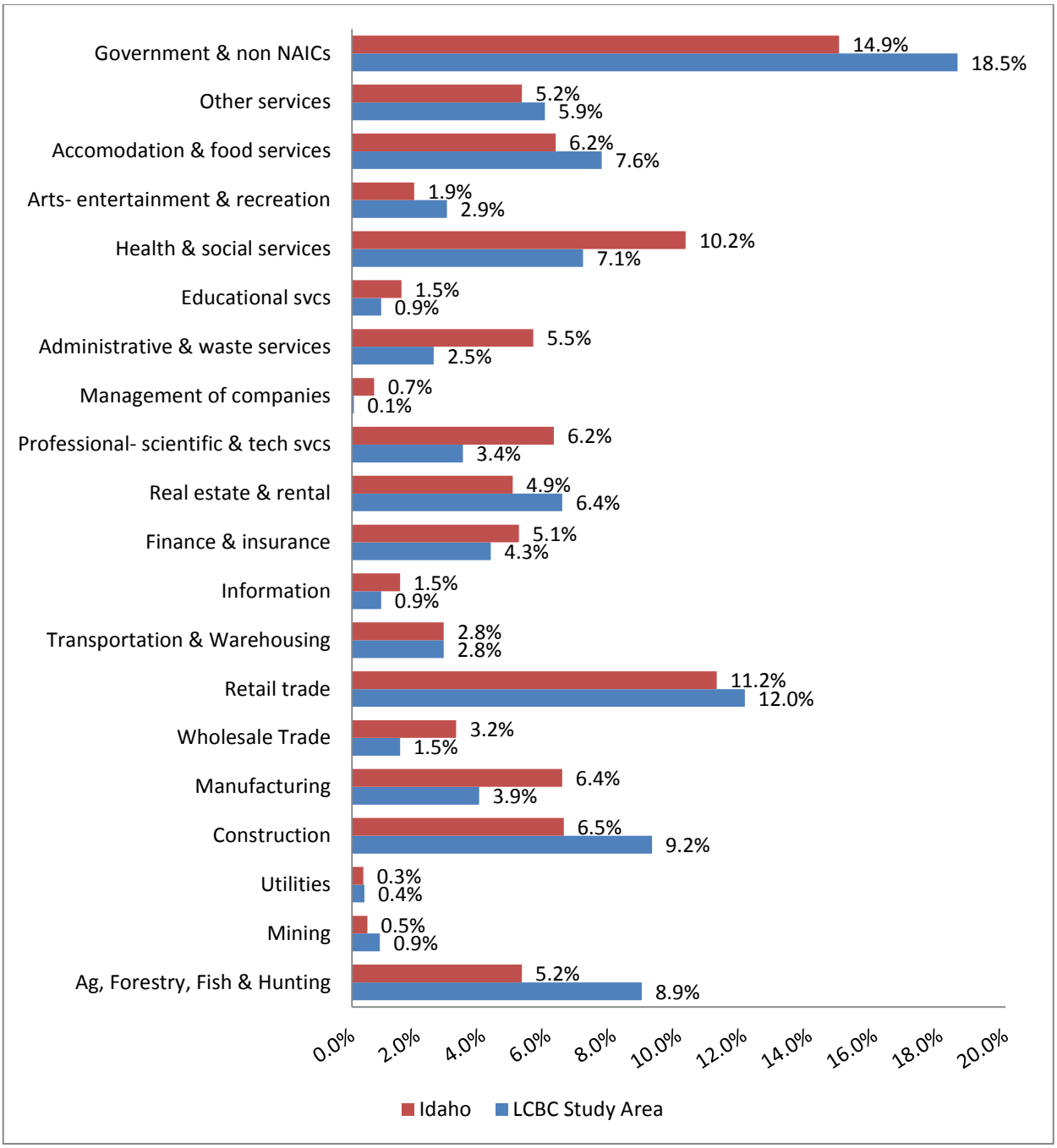
The local economy which surrounds the Lost Creek-Boulder Creek Project area is diverse and supports employment in 176 industries. Assessing employment by industrial sectors helps identify industries which are important to the local economy. Economies with higher levels of diversification generally offer greater employment opportunities to local residents and foster greater stability since the region's economic activity is more evenly disbursed across industrial sectors. 2010 employment in aggregated industrial sectors as a share of total employment within Adams, Idaho and Valley counties is shown below in Figure EC-2 (IMPLAN 2010). Although employment in the study area is supported by numerous industrial sectors, approximately 30 percent of all local employment is supported by the Government (18.5 percent) and Retail Trade (12.0 percent) sectors. While the Government and Retail Trade sectors are the two most important industrial sectors within the study area, the Construction (9.2 percent); Agriculture, Forestry, Fishing, and Hunting (8.9 percent); and Accommodation and Food Services (7.6 percent) sectors are also large employers within the project study area.



Source: IMPLAN 2010

Figure EC-2. 2010 Employment

Highly specialized economies (i.e., those that depend on a few industries for the bulk of employment and income) are more prone to cyclical fluctuations and generally support limited job opportunities. The Interior Columbia Basin Ecosystem Management Project identified communities that were specialized with respect to employment using the ratio of the percent employment in each industry in the region of interest (Adams, Idaho and Valley counties) to the percent of employment in that industry for a larger reference region (the state of Idaho). For a given industry, when the percent employment in the analysis region is greater than in the reference region, local employment specialization exists in that industry (USDA Forest Service 1998). Applying this criterion to 2010 employment data for the Lost Creek-Boulder Creek project area reveals that the region is most specialized with respect to Agriculture, Forestry, Fishing and Hunting (+ 3.7 percent), Government (+ 3.6 percent), and Construction (+ 2.7 percent). While these sectors collectively support 26 percent of total employment across the state, these sectors support more than 36 percent of all jobs in Adams, Idaho, and Valley Counties. Relative to the state of Idaho, the three-county local economy is less specialized with respect to Health and Social Services, Professional Services, Administrative and Waste Services, and Manufacturing.



Source: IMPLAN 2010

Figure EC-3. Sector Employment as Share of Total State and County Employment

Identifying important industries and regional specialization is of particular interest when sectors relating to current and proposed forest management actions are shown to support a large share of local employment. As discussed above, the local economy which surrounds the Lost Creek-Boulder Creek Project area is specialized with respect to Agriculture, Forestry, Fishing and Hunting (+ 3.7 percent), Government (+ 3.6 percent), and Construction (+ 2.7 percent) sectors; and that largest employers within the study area were industries that were classified under the Government and Retail Trade sectors. The strong presence of these

sectors highlights the importance of the Payette NF to local economic vitality. While the Lost Creek-Boulder Creek project area accounts for only a small portion of the National Forest, a small portion of employment in these sectors can be attributed to forest management, timber production, and outdoor recreation within the project area. For a more detailed discussion of how these activities contribute to local employment see the Timber & Forest Products, Recreation and Forest Expenditures and Employment sections under Forest Contributions.

Personal Income

Personal income is a key indicator of the economic well-being of a county and provides a measure of all sources of income within Adams, Idaho and Valley counties. High personal income may be a sign of greater job opportunities, highly skilled residents, greater economic resiliency, and well-developed infrastructure; while low personal income is often a reflection of the poor economic conditions and relatively few economic opportunities available within a region. Total personal income (TPI) in the study area exceeded $935 million dollars in 2011. Between 1990 and 2011 total personal income in Adams, Idaho and Valley counties grew by 55 percent (adjusted for inflation and reported in 2011 dollars) (Bureau of Economic Analysis, 2012).

Per capita personal income (PCPI) measures average income per person in a region. Historically PCPI in Idaho and the Lost Creek-Boulder Creek Project study area has been lower than PCPI across the country. As shown by Table EC-5, PCPI in the United States steadily increased between 1990 and 2011. While PCPI at the state level grew at a slightly slower rate than that of the nation, per capita personal income in the three-county study area grew at even more moderate rates. Between 1990 and 2011 PCPI (after being adjusted for inflation) grew by 21 percent in Adams County, 17 percent in Idaho County, and by 19 percent in Valley. Though personal income in the study area has increased, average PCPI within Adams and Idaho counties remains well below that of the state and the country (Bureau of Economic Analysis, 2012).

Table EC-5. Per Capita Income, 1990 & 2011 (adjusted for inflation and reported in 2011 dollars)

	1990	**2011**	***% Change 1990-2011***
United States	$ 33,309	$ 41,560	25%
Idaho	$ 26,853	$ 32,881	22%
Adams County	$ 23,162	$ 28,140	21%
Idaho County	$ 23,724	$ 27,827	17%
Valley County	$ 30,168	$ 35,942	19%

Source: Bureau of Economic Analysis, 2012

There are two major sources of personal income: (1) labor earnings or income earned through employment and (2) non-labor income. Labor earnings, or wages, were supported by a wide range of industrial sectors and represented approximately 50 percent of the study area's TPI in 2011. Although wages can fluctuate between counties and across industries, average annual wage in the project study area remain well below those of the state and the nation (Table EC-6). On average, study area jobs in Service related sectors paid 19 percent less than jobs in Non-services related fields.

Table EC-6. Average Annual Wages

	All Sectors	Services	*Non-Services*
United States	$ 49,289	$ 47,389	$ 57,676
Idaho	$ 36,149	$ 33,666	$ 43,694
Adams County	$ 32,345	$ 28,614	$ 34,404
Idaho County	$ 33,701	$ 29,292	$ 37,310
Valley County	$33,083	$30,340	$33,019

Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages, 2012

While the local economy surrounding the project area supports a large share of lower paying service jobs, the unique natural and cultural amenities of the forest may provide addition benefits which help offset these low wages. Living in close proximity to NFS lands provides residents with greater access to open spaces, wildlands and a wide range of recreational opportunities. While local residents may forego higher paying jobs in areas with fewer natural amenities, they gain personal enjoyment from the outdoor experiences they have on the Payette NF. In this manner some residents may earn a "secondary income" from local natural amenities which complements the income they earn through traditional employment. Natural amenities, often provided by public lands, have been found to influence population and employment changes in amenity rich communities (Knapp and Graves 1989, Clark and Hunter 1992, Treyz et al. 1993, Mueser and Graves 1995, McGranahan 1999, Lewis et al. 2002). Although the project area encompasses only a small portion of the Payette NF, the unique natural and cultural amenities of the projects area contribute to the attractiveness of local communities and increases regional well-being.

Non-Labor Income

Personal income also includes non-labor income individuals receive from sources other than an employer. In general there are two categories of non-labor income, investment income (dividends, interest, and rent payments) and transfer payments from the government to individuals (Retirement & disability insurance, medical payments, welfare assistance, unemployment, and veteran's benefits). Non-labor income's share of TPI has grown drastically in recent years. In 1970 non-labor income accounted for nearly 24 percent of TPI within the study area. By 2011 non-labor income had grown to represent approximately 50 percent of TPI in the three-county study area (Bureau of Economic Analysis, 2012).

Non-labor income's increasing share of regional TPI can be attributed to increases in both investment income and transfer payments. Between 1970 and 2011 investment income as a share of TPI within the study area grew from 14.6 percent to 23.7 percent while transfer payments increased from 9.6 percent to 25.8 percent. As shown in Table 7, non-labor income share of TPI in all study area counties exceeds shares at the state and national level. Transfer payments in the study area played a more significant role in supporting personal income than at the state or national level, with age and income maintenance payments contributing a larger share of TPI (Bureau of Economic Analysis, 2012).

Table EC-7. Non-labor Income

	Total Personal Income ($1000)	Non-Labor Income Share	Percent of Total Personal Income		
			Investment Income	Age Related Transfer Payments	Income Maintenance Related Transfer Payments
United States	$13,221,853,005	34%	16%	10%	5%
Idaho	$53,210,677	36%	17%	11%	5%
Study Area	$935,207	49%	26%	15%	4%
Adams County	$114,264	55%	28%	19%	4%
Idaho County	$467,257	48%	23%	17%	5%
Valley County	$353,687	48%	29%	13%	3%

Source: Bureau of Economic Analysis 2012

As discussed earlier in the demographics section, the population surrounding the Lost Creek-Boulder Creek Project area is slightly older than the general population and the region's median age is likely to rise as baby-boomers age and more retirees relocate to the area. As the region's baby boom population grows, age related transfer payments as a share of income from non-labor sources is likely to rise. Since communities with more retired residents are typically less dependent on employment as a source of income, communities with aging populations may be more resilient to economic downturns (USDA-USFS 2010).

Rural county population change, the development of rural recreation and retirement-destination areas are all related to natural amenities (McGranahan 1999, Henderson 2005, Saint Onge 2007). As a steward of natural amenities, the Payette NF can be consequently be attributed with attracting a portion of retirees and age-related non-labor income to the region. Thus, the Lost Creek-Boulder Creek Project area plays a small role in fostering a more resilient economy.

Environmental Justice

In 1994, President Clinton issued Executive Order 12898. This order directs federal agencies to focus attention on the human health and environmental conditions in minority and low-income communities. The purpose of EO 12898 is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority and low-income populations.

Environmental Justice (EJ) is the fair treatment and meaningful involvement of people of all races, cultures, and incomes, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The goal of environmental justice is for Federal agency decision-makers to identify impacts that are disproportionately high and adverse with respect to minority and low-income populations and identify alternatives that will avoid or mitigate those impacts. According to USDA DR5600-002 (USDA 1997), EJ, minority, minority population, low-income, and human health and environmental effects, are defined as follows:

Environmental Justice means that, to the greatest extent practicable and permitted by law, all populations are provided the opportunity to comment before decisions are rendered on, are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner by, government programs and activities affecting human health or the environment.

Minority means a person who is a member of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic.

Minority Population means any readily identifiable group of minority persons who live in geographic proximity to, and, if circumstances warrant, migrant farm workers and other geographically dispersed/transient persons who will be similarly affected by USDA programs or activities.

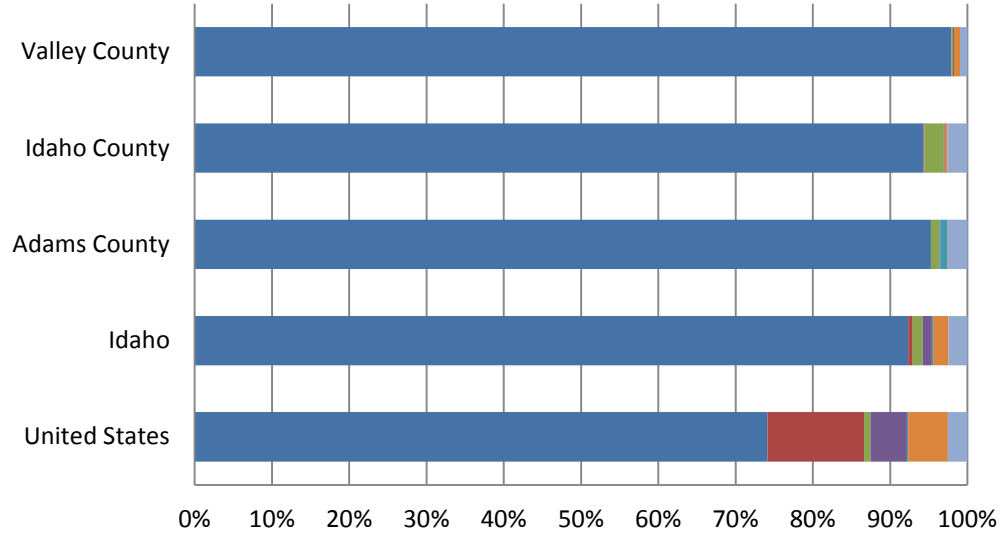
Low-Income Population means any readily identifiable group of low-income persons who live in geographic proximity to, and, if circumstances warrant, migrant farm workers and other geographically dispersed/transient persons who will be similarly affected by USDA programs or activities. Low-income populations may be identified using data collected, maintained and analyzed by an agency or from analytical tools such as the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty.

Human Health and/or Environmental Effects as used in this Departmental Regulation include interrelated social and economic effects.

The emphasis of environmental justice is on health effects and/or the benefits of a healthy environment. The CEQ has interpreted health effects with a broad definition: "Such effects may include ecological, cultural, human health, economic or social impacts on minority communities, low-income communities or Indian Tribes …when those impacts are interrelated to impacts on the natural or physical environment" (CEQ 1997).

Race and Ethnicity

As shown in Figure EC-4, Idaho's population is predominately white and significantly less diverse than the general U.S. populations. Adams and Idaho counties are even less racially diverse than the general population of the state. In 2010 the overwhelming majority of residents in Adams, Idaho and Valley counties were reported to be white alone. Although minority racial groups account for only a small portion of the study area's total population, Native Hawaiian and many local residents identify themselves as American Indian, Native Hawaiian or some other Pacific Islander, or being belonging to two or more races.



	United States	Idaho	Adams County	Idaho County	Valley County
White alone	74%	92%	95%	94%	98%
Black or African American alone	13%	1%	0%	0%	0%
American Indian alone	1%	1%	1%	2%	0%
Asian alone	5%	1%	0%	0%	0%
Native Hawaiian & Other Pacific Is	0%	0%	1%	0%	0%
Some other race alone	5%	2%	0%	0%	1%
Two or more races	3%	2%	3%	3%	1%

Source: U.S. Census Bureau 2012

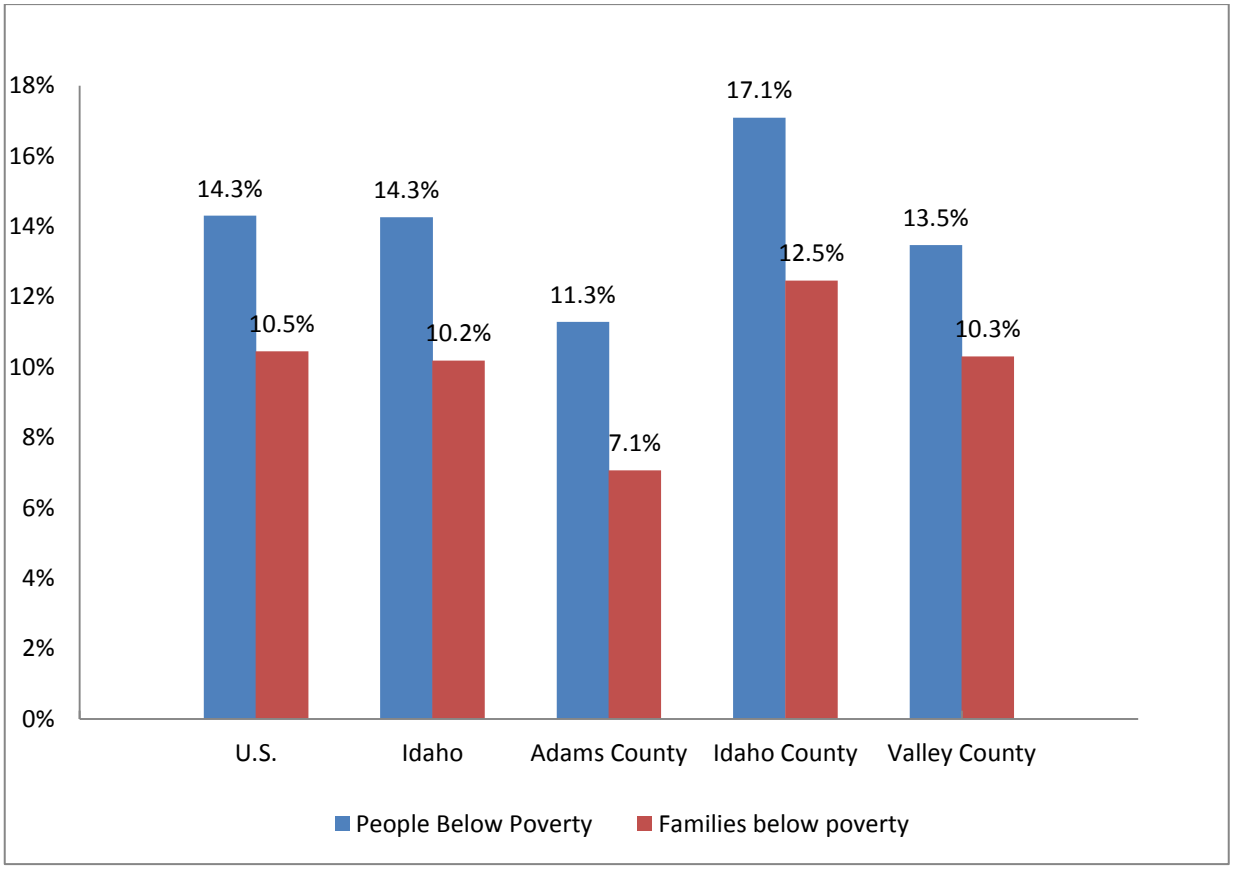
Figure EC-4. Racial Composition, 2011

Many Americans identify with racial groups based on physical attributes but continue to be proud of the cultural heritage from which they descend. Although Americans may appear to look White, Black, Asian, or belonging to some other racial group, they often continue to speak the native language and follow cultural traditions from the regions where their families originated. This is especially common among Americans of Hispanic, Latin, or Spanish descent. In 2010 roughly 16 percent of Americans described their family ancestry as being Hispanic, Latin, or Spanish. While these cultures have a noticeable presence in the United States, less than 11 percent of the state and 3 percent study area's population reported being of Hispanic descent (U.S. Census Bureau, 2010).

Poverty

Poverty is an import indicator of both economic and social well-being. Individuals with low incomes are more vulnerable to a number of hardships which may negatively affect their health, cognitive development, emotional well-being, school achievement and promote socially unacceptable behavior (Williams 1984,

Patterson 1991, Haan et. al 1986, Battistich et. al 1995, Farrington 1995, Chung 2004, Booth and Caan, 2005, and Hopson and Lee 2011). In general, low income individuals tend to rely more heavily on natural resources and depend more directly on NFS lands for sustenance and home heating. Since these individuals will be more vulnerable to changes in the management of local resources, it is important for forest management to understand how these forest users may be affected by restricting forest uses. Following the Office of Management and Budget's Directive 14, the Census Bureau uses a set of income thresholds that vary by family size and composition to detect who is poor. If the total income of an individual or family falls below the relevant poverty threshold, then individual or family is classified as being "below the poverty level."



Source: U.S. Census Bureau 2012

Figure EC-5. Poverty Rates, 2011

As illustrated by Figure EC-5, poverty rates for the state of Idaho mirror those of the general U.S. population. In 2011 it was estimated that approximately 14 percent of individuals and 10 percent of families in Idaho and across the U.S. fell below the poverty line. Poverty rates for individuals and families living in the three counties of interest varied considerably. While poverty rates for Valley County are very comparable to rates at the state and national level, there was greater divergence between poverty rates in Adams and Idaho counties. In 2011 approximately 11 percent of individuals and 7 percent of families falling below the poverty line in Adams, while 17 percent of individuals and nearly 13 percent of families in Idaho County were reported to be living below the poverty line.

Table EC-8 shows poverty rates by race and ethnicity. These statistics highlight the racial composition of low income populations living below the poverty line. Populations in Adams, Idaho, and Valley counties are predominately white and account for the overwhelming majority of individuals living below the poverty line. Although minority racial groups accounted for 5 percent, 6 percent and 2 percent of the population in Adams, Idaho and Valley counties, minority groups accounted for 10.7 percent of all people living in poverty in Adams County and 8.8 percent in Idaho County. In 2011 biracial and multiracial Americans accounted for 3 percent of the population and nearly 8 percent of all people living below the poverty line in Adams County. In Idaho County, Native Americans accounted for 2 percent of the population but nearly 7 percent of all Idaho County residents living in poverty (U.S. Census Bureau 2012). These statistics suggest that Native Americans in Idaho County and biracial/ multiracial individuals in Adams County are disproportionately poor and have the potential to experience disproportionately high and adverse effects related to changes in the management of forest resources. To mitigate adverse impacts to EJ populations, forest management may need to facilitate additional public outreach in these communities to ensure that EJ populations are involved in scoping and alternative development.

Table EC-8. Poverty by Race and Ethnicity, 2011

	U.S.	*Idaho*	*Adams County*	*Idaho County*	*Valley County*
White alone	60.0%	87.2%	89.3%	91.2%	96.1%
Black or African American alone	22.2%	0.9%	0.0%	0.0%	0.0%
American Indian alone	1.5%	2.3%	2.3%	6.7%	0.0%
Asian alone	3.9%	1.7%	0.7%	0.3%	0.4%
Native Hawaiian & Other Pacific Island	0.2%	0.2%	0.0%	0.2%	0.0%
Some other race	8.9%	3.8%	0.0%	0.0%	2.5%
Two or more races	3.3%	4.0%	7.7%	1.6%	1.0%
Hispanic or Latino (of any race)	26.2%	21.2%	4.8%	2.5%	7.7%

Source: U.S. Census Bureau 2012

3.9.3 Environmental Consequences

Tools and Data Sources

The analysis of economic effects considers market-related values in a financial efficiency analysis as well as job and labor income in an economic impact analysis. Non-market values, such as the value of recreation experiences and ecological services, by their nature are difficult to quantify. Direction provided in 40 CFR 1502.23 and Forest Service Handbook 1909.15, (7/6/04) and 22.35 (01/14/05) provides for the use of qualitative analysis to evaluate the effects of these non-market values. Since proposed activities are anticipated to improve current resources conditions, these activities are highly likely to increase non-market values associated with the natural resources within the Lost Creek Boulder Creek Project area.

Improvements to resources conditions from proposed activities are described in other resource sections of this DEIS and in project record specialist reports.

Financial efficiency is a comparison of the costs and benefits that can be quantified in terms of actual dollars spent or received in the impact area over the life of the project. As the Forest Service Handbook 2409.18 indicates, this analysis provides a comparison of anticipated costs and revenues that are part of Forest Service monetary transactions. Given the information provided, financial efficiency measures are calculated in this analysis to provide a means of comparing the financial efficiency of alternatives. This analysis offers a consistent measure for comparison of alternatives, however, it should not be viewed as a complete answer, but as only an examination of trade-offs between costs and benefits. The financial efficiency measures discussed below, along with social, ecological or other non-market values discussed throughout the document, provide a complete comparison of the alternatives.

The alternatives are compared using a financial efficiency measure called Present Net Value (PNV). This measure is generated with use of program developed by the USDA Forest Service called Project Economic Analysis Tool (PEAT) and depends on a principle called the "Time Value of Money." The idea is that money received now is worth more than same amount received in the future. This makes sense because the money received now could be put to some advantageous use or interest can accrue until the future date. Using this concept, benefits and costs occurring in the future must be discounted back to represent their current value. A 4-percent discount rate is commonly used for evaluations of long-term investments and operations in land and resource management by the Forest Service (FSM 1971.21). This discount rate is used in the calculation of PNV.

According to OMB Circular A-94, PNV is the standard criterion for deciding whether a project is economically justifiable. PNV is a way of comparing all monetarily valued costs and benefits, and is calculated by subtracting the discounted sum of costs from the discounted sum of benefits. A positive PNV suggests the discounted sum of benefits is greater than the discounted sum of costs, and a negative PNV suggests the opposite.

Management of the Forest is expected to yield positive benefits, but not necessarily financial benefits. Costs for proposed restoration activities were estimated based on recent experienced costs from other projects on the Payette NF (e.g. prescribed burning, understory thinning, noxious weed control, and trail improvements) and professional estimates provided by Lost Creek-Boulder Creek Project resource specialists. These estimates were provided to the project economist and used to inform the PEAT model. Non-harvest related costs are included in the PNV analysis, but they are not included in appraised timber value.

Economic impacts in terms of employment and labor income are used to evaluate potential direct, indirect, and cumulative effects on the impact area economy. Economic impacts are estimated using input-output analysis. Input-output analysis is a means of examining relationships within an economy, both between businesses and between businesses and final consumers; it captures all monetary market transactions for consumption in a given time period. The resulting mathematical representation allows one to examine the effect of a change in one or several economic activities on an entire economy, all else constant. This examination is called impact analysis and the input-output modeling tool most commonly used by the Forest Service is IMPLAN. The IMPLAN modeling system allows the user to build regional economic models of one or more counties for a particular year. The model for this analysis used the 2010 IMPLAN

data. IMPLAN translates changes in final demand for goods and services into resulting changes in economic effects, such as labor income and employment of the affected area's economy.

The economic impact effects are measured by estimating the direct jobs and labor income generated by (1) the processing of the timber volume from the project, and (2) the dollars resulting from any restoration activities of the project into the local economy affected by the treatments proposed. The direct employment and labor income benefit employees and their families and, therefore, directly affect the local economy. Additional indirect and induced multiplier effects (ripple effects) are generated by the direct activities. Together the direct and multiplier effects comprise the total economic impacts to the local economy.

The data used to estimate the direct effects from the timber harvest and processing were provided by the University of Montana's Bureau of Business and Economic Research (Morgan et al. 2007). This national data is broken into multi-state regions and is considered more accurate than that which is available from IMPLAN. The BBER Region for Idaho and Montana is used for this analysis given the concentration of sawmills in Idaho expected to receive volume from this project. The BBER data represents the results of mill censuses that correlate production, employment, and labor income. The discussion of potential jobs and income impacts should occur alongside consideration of non-market values and financial efficiency. Changes in final demand for goods and services provided by the National Forest can contribute to employment and income in the area. However, if demand exists for these products, employment and income would likely be supported in other areas if these goods and services are provided by other means. Therefore it is important to consider the efficiency of using these resources alongside potential job and income generation from their use.

Effects Common to all Alternatives

Economic Consequences

The economic analysis of the Lost Creek Boulder Creek Restoration Project uses two types of analysis: (1) regional economic impact analysis and (2) financial efficiency analysis.

Regional Economic Impact

Economic impact analysis measures how activities under the Lost Creek-Boulder Creek Project would affect employment, income, and economic activity in the regional economy. Business patterns in the regional economy create a constant flow of goods, services, and people between counties surrounding the Payette NF and the Lost Creek-Boulder Creek Project area. To analyze how restoration treatments in the Lost Creek-Boulder Creek region of the Payette NF would affect the local economy, three counties adjacent to the National Forest were examined. The counties included in the study area are Adams, Idaho, and Valley.

Employment and labor income supported by forest management actions under the action alternatives are displayed below in Tables EC-9 and EC-10. Alternatives B, C, D and E propose restoration treatments to be carried out in the project area over a 10 year treatment period (with the exception of prescribed burning activities which are expected to occur over approximately 20 years). Results for Alternatives B, C, D and E reflect an increase in employment and income generated by proposed activities. These activities include construction associated with recreation improvements, harvesting and processing of commercial and non-commercial forest products, other activities associated with restoration treatments, and road work.

Table EC-9. Annual Employment by Activity Type under the Alternatives

Proposed Activities	Alt B	Alt C	Alt D	Alt E
Commercial Forest Products				
Logging and Processing	26	13	38	35
*Associated activities**	3	2	3	3
Recreation	< 1	< 1	< 1	< 1
Restoration	29	26	31	23
Road Work	5	4	5	3
Total Employment Contribution	63	46	77	64

*Thin, remove of machine pile, biomass removal, regeneration planning

Table EC-10. Annual Labor Income by Activity Type under the Alternatives (thousands of dollars)

Proposed Activities	Alt B	Alt C	Alt D	Alt E
Commercial Forest Products				
Logging and Processing	$ 919	$ 477	$ 1,359	$ 1,239
*Associated activities**	$ 62	$ 33	$ 63	$ 59
Recreation	$ 14	$ 15	$ 14	$ 14
Restoration	$ 748	$ 675	$ 794	$ 593
Road Work	$ 121	$ 101	$ 121	$ 83
Total Labor Income Contribution	$ 1,865	$ 1,301	$ 2,351	$ 1,989

*Thin, remove of machine pile, biomass removal, regeneration planning

Tourism and Visitor Spending

The recreation analysis is conducted at the forest level, for consistency with recreation use reporting methods undertaken in the National Visitor Use Monitoring effort in 2008. The Payette NF is estimated to support 810,000 visits each year. Although treatments considered under the action alternatives may temporarily negatively affect the quality of developed and dispersed recreation visits, treatments are not anticipated to cause a net change to project area visitation. In addition to restoration activities, additional improvements to facilities associated with outdoor recreation are proposed under all action alternatives. While investments to increase the quality and quantity of recreation related facilities are not anticipated to effect use levels, improvements to trails, restrooms, and camp sites would increase the quality of recreational experiences in the project area.

Restoration Treatments and Forest Products

Restoration treatments produce commercially-valuable forest products. Table EC-11 shows the project area's potential for forest products in terms of a possible range, and expected forest product volumes from treatments proposed under each alternative. These are the total volumes over the life of the restoration project; annually, approximately one-tenth of the volume would be harvested and processed.

Table EC-11. Forest Product Volumes by Alternative over the life of the Project

	Alternative B	Alternative C	Alternative D	Alternative E
Timber volume (mmbf[1]) Best Estimate	35.8	18.6	53.0	48.3
Timber volume (mmbf) Possible Range	25 to 55	13 to 27	33 to 82	33 to 70
Biomass (tons) Projected Removal	8,741	4,532	12,927	5,892
Biomass (tons) Projected Availability[2]	27,000-67,000	16,000-33,000	41,000-100,000	41,000-85,000

[1] - mmbf = million board feet
[2] – biomass projected availability is the estimated tons of non-sawlog material available. Although current markets do not exist to utilize this amount of biomass, if markets develop, this amount is estimated to be available.

Economic Efficiency

Economic efficiency analysis measures the ratio of economic benefits to economic costs resulting from activities under the Lost Creek-Boulder Creek Project. Forest restoration projects are designed primarily to meet non-commodity objectives, making it difficult to monetize project benefits as to fit within the net present value framework. Although forest restoration is anticipated to lead to positive outcomes, not all benefits realized through restoration treatments under the Lost Creek-Boulder Creek Project can be monetized due to data limitations and uncertainty. Therefore, the following discussion of economic efficiency is primarily descriptive in its analysis of tradeoffs.

Table EC-12 summarizes the net present value of restoration treatments from the Forest Service perspective. The first PNV indicates the financial efficiency of the timber sale, including all costs and revenues associated with the timber harvest and required design criteria. The second PNV includes all costs for the proposed action, including other restoration activities. A 4 percent discount rate was used over a period of 10 years (2014–2023), the estimated time required for full implementation of the project . Over the 10-year treatment period, assuming a 4 percent discount rate, the landscape restoration project is expected to cost the Forest Service between $20.9 and $25.8 million. This is the discounted cost to the government of the project.

Table EC-12. Present Value of Lost Creek-Boulder Creek Treatments over 10-year Period, 4 Percent Discount Rate

	Alternative B	Alternative C	Alternative D	Alternative E
Timber Harvest & Required Design Criteria				
PV Costs	$15,327,370	$15,722,799	$16,885,984	$15,215,067
PV Revenue	$2,897,751	$1,502,427	$4,285,714	$3,905,339
Present Net Value	($12,429,619)	($14,220,372)	($12,600,271)	($11,309,728)

All Proposed Project Activities				
PV Costs	$24,827,354	$24,810,044	$26,385,968	$21,442,844
PV Revenue	$2,897,751	$1,502,427	$4,285,714	$3,905,339
Present Net Value	($21,929,603)	($23,307,618)	($22,100,254)	($17,537,504)

Treatments proposed under the Lost Creek Boulder Creek Landscape Restoration project are intended to restore the structure and function of forests and watersheds in the analysis area. Benefits of these treatments include reduced fire hazard and increased ecosystem services and wood product removal.

Central to the economic efficiency analysis of forest treatment is the relationship between treatment (prescribed burning and mechanical thinning) and wildfire risk (incidence) and hazard (severity) reduction. Mercer (2000) notes that treatment is associated with a decrease in wildfire suppression costs and a decrease in net resource damage; however, the precise relationship between treatment and wildfire cost reduction is not identified. The preceding section analyzes direct costs and effects to health, tourism, ecosystem services, and the timber market.

Wildfire Costs

Wildfire costs are very difficult to predict because fires range enormously in size, terrain, and proximity to local communities. All of these factors will affect the direct cost of dealing with a wildfire. The direct costs of fire suppression include only expenses associated with personnel and supplies used to administer a prescribed burn or extinguish a wildfire. While suppression costs are generally only a small component of the total cost of a wildfire, the direst cost associated with fire suppression can exceed a million dollars per acre. According to the Incident Status Summary Report for the 2012 Wesley Fire on the Payette NF, the U.S. Forest Service spent more than $16.2 million to fight the 16,405 acre blaze (ISSR-109).

While fire is a natural part of forest ecosystems, the frequency and severity of wildfires has steadily risen across the Western United States causing annual suppression costs to increase rapidly. The direct cost of extinguishing a wildfire can be devastating for state and federal agencies. From 2000 to 2008, wildfire suppression funding increased from 25 percent to 44 percent of the U.S. Forest Service budget (WFLC 2010). Since federal and state budgets are finite, and increasingly limited in recent years, greater spending on wildfire suppression leaves less funding for activities that promote forest health and improve the quality of recreation opportunities for visitors.

Suppression costs are generally only a small component of the total cost of a wildfire. The Western Forestry Leadership Coalition finds that the total cost of wildfire ranges from two to 30 times greater than the suppression cost (WFLC 2010).

Treatment Costs

Treatment is associated with a decrease in wildfire suppression costs and a decrease in net resource damage (Mercer et al. 2000). Prescribed burning is often preferred to mechanical thinning due to the lower cost of prescribed burning. However, depending on proximity to urban centers, a full accounting of the costs of prescribed burning may reveal that mechanical thinning is more economically efficient in some circumstances. The cost of smoke exposure, for instance, is higher when prescribed burning occurs near population centers. Mechanical treatment also has costs that are not accounted for in the cost of

implementation, such as soil erosion. However, the indirect consequences of prescribed burning are more easily observable, which generally make it a less publicly popular treatment option.

Fuel reduction projects can significantly reduce the risk of catastrophic wildfire (WFLC 2010). Assessing the cost-benefit ratio of fuel reduction projects is questionable without information on the degree to which treatment reduces the risk of wildfire. Furthermore, the scale and cost of prevented wildfires is uncertain and widely variable. Anticipated reductions in the threat to human life and decreases in wildland fire related costs such as property loss, lost revenues and suppression costs are not included in the analysis of PNV for the alternatives. Fuels treatments under these alternatives will improve fuel conditions and make the surrounding area more resistant to large scale wildfires like the 2012 Wesley Fire. While the PNV of restoration treatments appears to be negative under all alternatives, the prevention of even one fire similar in size and severity as the Wesley Fire would make the PNV of restoration activities significantly less negative.

Health Impacts

Smoke is inevitable in the airsheds of Idaho, whether from wildfire or prescribed fire. Smoke can travel great distances and affect communities far away from the burn unit, sometimes persisting after the burn has been completed. Fires burning under historic conditions (wildfire or prescribed fire) produce behavior and effects that are low to moderate. Fires that burn under more extreme conditions (most/all fires in this category are wildfires) produce behavior and effects that are moderate to severe.

Ambient particulate matter (PM) concentrations increase substantially during a wildfire (Kochi et al. 2010b). A dose-response function is an equation that estimates the health consequences of exposure to pollution. Compared to conventional PM studies (based on urban air pollution), wildfire studies are “less likely to find a significant positive mortality effect in spite of the substantial increases in PM levels during the wildfire period” (Kochi et al. 2010a). There are several probable reasons for this finding, including: (1) urban air pollution and wildfire smoke are chemically different (wildfire smoke is generally less toxic), (2) wildfire events are more likely to promote averting behavior, such as evacuation (Kochi et al. 2010a). However, the wildfire studies did find increased hospital admissions linked to asthma and respiratory problems during wildfire events (Kochi et al. 2010a). PM studies find that the dose-response function is not linear. In other words, a doubling of PM concentration more than doubles the health consequences. Furthermore, at low-levels an increase in PM may result in no measureable health consequences (Kochi et al. 2010b).

Five key health outcomes are considered in the literature: (1) mortality, (2) restricted activity days, (3) hospital admissions, (4) respiratory symptoms, and (5) self-treatment. Kochi et al. (2010b) estimate that the cost of health effects due to smoke from wildfire events range from $0.26 million to $1.2 billion depending on the scale of the fire and the health outcomes considered.

The timing of prescribed fires is predictable, the volume of smoke produced is far less than in a wildfire, and there is time to notify the public when burns will be implemented. As a result, adverse health consequences are less likely to result from prescribed fires.

Tourism

During wildfire events, tourism decreases due to evacuations, road closures, and negative publicity (Mercer et al. 2000). Depending on the size and intensity of the wildfire, impacts to tourism may be long-lasting. Recreation and tourism displacement can reduce contributions to the local. In addition to the costs to local

businesses, individuals may have lower consumer surplus values if they must recreate at a substitute site due to the presence of fire or smoke.

Knotek et al. (2008) find that local visitors are more accepting of prescribed fire than non-local visitors are. This finding may be due to (1) better communication between federal agencies and local residents, (2) more local familiarity with the role of fire in the landscape, or (3) more opportunities to engage in substitute behavior.

Ecosystem Services

Wildfire has the potential to reduce ecosystem service values through: (1) destruction of wildlife habitat, (2) water quality and watershed impacts, (3) damage to cultural and archaeological sites, and (4) soil erosion and impacts to water quality (Morton et al. 2003). In contrast, forest restoration has the potential to improve ecosystem services. Expected ecosystem service benefits of the Lost Creek-Boulder Creek restoration treatments include:

1. Reduction of unnaturally large wildfires
2. Protection of watersheds, leading to increases in surface water and decreases in soil loss
3. Diversification of understory composition and protection of rare habitat from fire
4. Better management of wildlife habitat
5. Enhanced recreation that is aesthetically pleasing
6. Sequestering carbon in large trees and soils (Combrink et al. 2012).

Timber Market

Prescribed burning allows for the measured and controlled use of fire to manage forest density and health. Wildfire events, however, are unplanned and have the potential to cause extreme destruction. Wildfires can be a substantial shock to timber markets. Following a wildfire, some of the killed timber is salvaged and brought to market. This can flood markets, temporarily decreasing the price of timber. While processing capacity is generally too low to lead to a substantial price shock, the price of timber may increase over the long-run due to reduced timber inventories (Mercer et al. 2000).

Alternative A: No Action

Under the No Action Alternative, no direct effects on the local economy would occur from the Lost Creek-Boulder Creek Restoration Project.

Indirect effects on local economic conditions could occur as a result of the No Action Alternative; however estimates of these changes are not available. For example, the lack of fuels treatment could increase wildland fire-related costs, such as property loss, lost revenues, and suppression costs. Fire suppression costs and risk to life and property should be less when wildland fires occur where hazardous fuels have been treated compared to areas where fuels have not been treated. This is commonly accepted since fires generally burn hotter, flame length is higher, and fires in tree canopies are more likely in non-treated areas. However, it is not possible to predict the level and costs of non-prescribed wildland fire under the No Action Alternative.

Cumulative Effects

The lack of measurable direct and indirect effects translates to a lack of measurable cumulative effects to economic conditions under the No Action Alternative.

Alternative B: Proposed Action

The Payette NF proposes to implement restoration treatments over a 10 year period (except for prescribed burning, which will be carried out over approximately 20 years) to restore the structure and function of forests and watersheds within the Lost Creek Boulder Creek area. This alternative includes commercial and non-commercial vegetation treatments on approximately 40,100 acres, and prescribed burning on approximately 45,000 acres over the life of the project.

Financial Efficiency

As discussed above, the PNV is the discounted sum of benefits minus discounted costs associated with each scenario. The financial efficiency analysis is specific to the timber harvest and ecosystem management associated with the project (as directed in Forest Service Manual 2400–Timber Management and guidance found in the Forest Service Handbook 2409.18). Costs for sale preparation, sale administration, regeneration, and ecosystem restoration are included. All costs, timing, and amounts were developed by the specialists on the project's interdisciplinary team. The expected revenue is the corresponding predicted high bid of $50 per CCF. The predicted high bid is used for the expected revenue (rather than the appraised stumpage rate) since the predicted high bid is the best estimate of the high bid resulting from the timber sale auction. The actual timber value will depend on the market when the timber is sold, and may be higher or lower than the predicted high bid. Present Net Value was calculated using PEAT, a program for economic analysis of long-term, on-the-ground resource management projects.

Table EC-12 indicates that the proposed alternative is financially inefficient for the timber harvest and required design criteria, as well as for all activities, as indicated by the negative PNV. The PNV for the proposed action is negative $12.4 million for the timber harvest and required design criteria and negative $21.9 million for all planned activities. As discussed above, there are many indirect effects which are not captured in the analysis of financial efficiency. Fuels treatments under this alternative would contribute to fuels conditions that would have more resistance to wildland fire. Treatments proposed under this alternative could reduce the threat to human life and decrease wildland fire related costs such as property loss, lost revenues and suppression costs. If treatments proposed under this alternative successfully prevented even one fire similar in size and severity as the Wesley Fire, the PNV of these restoration activities would be significantly less negative.

Employment & Labor Income Impacts

Economic impacts, in terms of employment and labor income, associated with the Lost Creek-Boulder Creek Restoration Project activities (timber harvest, restoration activities, road work, and recreation improvements) are estimated with the IMPLAN input-output model described above. Timber production, restoration activities, road work, and recreation improvements from this project would have direct and indirect effects on local jobs and labor income.

For timber harvest, the direct employment and labor income response coefficients (e.g., jobs and labor income per million cubic feet) were derived by the University of Montana's Bureau of Business and Economic Research. The indirect and induced multiplier effects were estimated using the IMPLAN model

for the three-county impact area. For restoration, road work, and recreation improvements, the direct, indirect and induced effects were derived using IMPLAN.

Commercial forest products: While there is potential to harvest between 25 and 55 million board feet (mmbf) of sawtimber and 27,000-67,000 tons of biomass under Alternative B it is anticipated that 35.8 mmbf of sawtimber and 8,741 tons of biomass would be harvested. The harvesting and processing of these commercial forest products would support 26 jobs and $919,000 in local labor income on annual average. In addition to the employment and income contributions of logging and processing, the thinning, remove or machine piling, biomass removal, and regeneration planning associated with these commercial forest products would support an additional 3 jobs and $62,000 in labor income on annual average over the life of the project. This analysis assumes the timber would be processed within the designated impact area. However, if some of the timber were processed outside the region, then a portion of the jobs and income would be lost by this regional economy.

Recreation related improvements: Although treatments will likely create noise, dust, and smoke which may negatively affect the short-term quality of recreational experiences within the project one treatment days, proposed treatments are not anticipated to effect overall forest visitation. As section 4.6 of the National Visitor Use Monitoring (NVUM) surveys for the forests demonstrate, when individuals are unable to visit their preferred site, most will engage in substitute behavior that will continue to have an effect in the local economy (USFS 2011a, USFS 2011b). As a result, treatments considered under Alternative B are not expected to measurably reduce the economic contributions of recreation within the study area.

However, Alternative B does propose to build several new restrooms and camp sites near Lost Valley Reservoir and to make trail improvements which would increase the quality of recreational experiences. Recreationists would benefit from the higher quality of recreational experiences supported by the project area, and will likely result in higher non-market values associated with Lost Creek-Boulder Creek Project area lands. The construction of new and improvement to existing recreation related facilities will also generate new work for private contracting and U.S. Forest Service force labor. The recreation improvements included in this alternative would support a portion of 1 job and approximately $14,000 in labor income in the local economy on annual average over the life of the project.

Restoration activities: Restoration activities proposed under Alternative B would include commercial and non-commercial vegetation treatments on approximately 40,000 acres. Treatments under this alternative include prescribed burning, thinning, and noxious weed control. These activities will be implemented using a combination of contract and Forest Service force labor and are estimated to support 29 jobs and approximately $748,000 in labor income across the three-county impact area on annual average over the next 10 years.

Road work: While some road work will be associated with the commercial harvesting of forest products, Alternative B proposes additional road work to improve, maintain, and decommission roads within the project area. Additional road work associated with gravel, aquatic organism passages, and wildlife enclosures are proposed under this alternative. Forest specialists have indicated that the majority of road work would be contracted out to firms operating out of the three-county impact area. Road work proposed under this alternative is estimated to support 5 jobs and $121,000 in labor income across Adams, Idaho and Valley counties on annual average over the life of the project.

IMPLAN estimates all activities proposed under Alternative B would support approximately 63 jobs (direct, indirect and induced) and $1.8 million in local labor income (direct, indirect and induced) on annual

average over the life of the project (Tables EC-9 and EC-10). Since the expenditures occur over a 10-year period, the estimated impacts of jobs and labor income would be spread out over the life of the project. These are not new jobs or income, but rather jobs and income that can be attributed to activities carried out by this restoration project.

Cumulative Effects

Ecological benefits and economic impacts from the Lost Creek-Boulder Creek Restoration Project would accrue over the life of the project. As shown in Table EC-13, the commercial forest products, recreation related improvements, restoration activities, and road work associated with Alternative B would support a total of 637 jobs and more than $18.6 million in local labor income over the 10 years activities are proposed.

Table EC-13. Cumulative Effects of Alternative B

Proposed Activities	Jobs	Income ($1,000's)
Commercial Forest Products		
Logging and Processing	260	$ 9,190
*Associated activities**	30	$ 625
Recreation	6	$ 143
Restoration	292	$ 7,478
Road Work	49	$ 1,212
Total Contribution	637	$ 18,648

Alternative C

The Payette NF proposes to implement restoration treatments over a 10 year period (except for prescribed burning, which will be carried out over approximately 20 years) to restore the structure and function of forests and watersheds within the Lost Creek Boulder Creek area. Alternative C is designed to move Boulder Creek toward WCF condition class 1 and Forest Plan WCI category FA (Functioning Appropriately) for road density. This alternative was developed to respond to comments that requested a more effective watershed restoration effort, as well as elk security and other wildlife concerns.

Financial Efficiency

As discussed above, the PNV is the discounted sum of benefits minus discounted costs associated with each scenario. The financial efficiency analysis is specific to the timber harvest and ecosystem management associated with the project (as directed in Forest Service Manual 2400–Timber Management and guidance found in the Forest Service Handbook 2409.18). Costs for sale preparation, sale administration, regeneration, and ecosystem restoration are included. All costs, timing, and amounts were developed by the specialists on the project's interdisciplinary team. The expected revenue is the corresponding predicted high bid of $50 per CCF. The predicted high bid is used for the expected revenue (rather than the appraised stumpage rate) since the predicted high bid is the best estimate of the high bid resulting from the timber sale auction. The actual timber value will depend on the market when the timber is sold, and may be higher or lower than the predicted high bid. Present Net Value was calculated using PEAT, a program for economic analysis of long-term, on-the-ground resource management projects.

Table EC-12 indicates that the Alternative C is financially inefficient for the timber harvest and required design criteria, as well as for all activities, as indicated by the negative PNV. The PNV for the proposed

action is negative $14.2 million for the timber harvest and required design criteria and negative $23.3 million for all planned activities. As discussed above, there are many indirect effects which are not captured in the analysis of financial efficiency. Fuels treatments under this alternative would contribute to fuels conditions that would have more resistance to wildland fire. Treatments proposed under this alternative could reduce the threat to human life and decrease wildland fire related costs such as property loss, lost revenues and suppression costs. If treatments proposed under this alternative successfully prevented even one fire similar in size and severity as the Wesley Fire, the PNV of these restoration activities would be significantly less negative.

Employment & Labor Income Impacts

Economic impacts, in terms of employment and labor income, associated with the Lost Creek-Boulder Creek Restoration Project activities (timber harvest, restoration activities, road work, and recreation improvements) are estimated with the IMPLAN input-output model described above.

Commercial forest products: While there is potential to harvest between 13 and 27 mmbf of sawtimber and 16,000-33,000 tons of biomass under Alternative C, it is anticipated that 18.6 mmbf of sawtimber and 4,532 tons of biomass would be harvested. The harvesting and processing of these commercial forest products would support 13 jobs and $477,000 in local labor income on annual average. In addition to the employment and income contributions of logging and processing, the thinning, remove or machine piling, biomass removal, and regeneration planning associated with these commercial forest products would support an additional 2 jobs and $33,000 in labor income on annual average over the life of the project. This analysis assumes the timber would be processed within the designated impact area. However, if some of the timber were processed outside the region, then a portion of the jobs and income would be lost by this regional economy.

Recreation related improvements: Although treatments will likely create noise, dust, and smoke which may negatively affect the short-term quality of recreational experiences within the project one treatment days, proposed treatments are not anticipated to effect overall forest visitation. As section 4.6 of the National Visitor Use Monitoring (NVUM) surveys for the forests demonstrate, when individuals are unable to visit their preferred site, most will engage in substitute behavior that will continue to have an effect in the local economy (USFS 2011a, USFS 2011b). As a result, treatments considered under Alternative C are not expected to measurably reduce the economic contributions of recreation within the study area.

However, Alternative C does propose to build several new restrooms and camp sites near the reservoir and to make trail improvements which would increase the quality of recreational experiences. Recreationists will benefit from the higher quality of recreational experiences supported by the project area, and will likely result in higher non-market values associated with Lost Creek-Boulder Creek Project area lands. The construction of new and improvement to existing recreation related facilities will also generate new work for private contracting and U.S. Forest Service force labor. The recreation improvements included in this alternative would support a portion of a1 job and approximately $15,000 in labor income in the local economy on annual average over the life of the project.

Restoration activities: Restoration activities proposed under Alternative C would include commercial and non-commercial vegetation treatments, but due to wildlife, hydrological, and SWRA concerns treatments are more restricted than under Alternative C. Treatments under this alternative include prescribed burning, thinning, and noxious weed control. These activities will be implemented using a combination of contract

and Forest Service force labor and are estimated to support 26 jobs and approximately $675,000 in labor income across the three-county impact area on annual average over the next 10 years.

Road work: While some road work will be associated with the commercial harvesting of forest products, Alternative C proposes additional road work to improve, maintain, and decommission roads within the project area. Additional road work associated with gravel, aquatic organism passages, and wildlife enclosures are proposed under this alternative. Forest specialists have indicated that the majority of road work would be contracted out to firms operating out of the three-county impact area. Road work proposed under this alternative is estimated to support 4 jobs and $101,000 in labor income across Adams, Idaho and Valley counties on annual average over the life of the project.

IMPLAN estimates all activities proposed under Alternative C would support approximately 46 jobs (direct, indirect and induced) and nearly $1.3 million in local labor income (direct, indirect and induced) on annual average over the life of the project (Tables EC-9 and EC-10). Since the expenditures occur over a 10-year period, the estimated impacts of jobs and labor income would be spread out over the life of the project. These are not new jobs or income, but rather jobs and income that can be attributed to activities carried out by this restoration project.

Cumulative Effects

Ecological benefits and economic impacts from the Lost Creek-Boulder Creek Restoration Project would accrue over the life of the project. As shown in Table EC-14, the commercial forest products, recreation related improvements, restoration activities, and road work associated with Alternative C would support a total of 462 jobs and more than $13 million in local labor income over the 10 years activities are proposed.

Table EC-14. Cumulative Effects of Alternative C

Proposed Activities	Jobs	Income ($1,000's)
Commercial Forest Products		
Logging and Processing	135	$ 4,765
*Associated activities**	16	$ 330
Recreation	7	$ 154
Restoration	264	$ 6,751
Road Work	41	$ 1,007
Total Contribution	462	$ 13,007

Alternative D

The Payette NF proposes to implement restoration treatments over a 10 year period (except for prescribed burning, which will be carried out over approximately 20 years) to restore the structure and function of forests and watersheds within the Lost Creek Boulder Creek area. Alternative D is designed to respond to comments that requested the maximum level of vegetation treatment s to produce the most economic benefit; and to comments relating to the intensity and benefit of treatments (species composition, level of vegetation restoration, and spatial arrangement).

Financial Efficiency

As discussed above, the PNV is the discounted sum of benefits minus discounted costs associated with each scenario. The financial efficiency analysis is specific to the timber harvest and ecosystem management associated with the project (as directed in Forest Service Manual 2400–Timber Management and guidance

found in the Forest Service Handbook 2409.18). Costs for sale preparation, sale administration, regeneration, and ecosystem restoration are included. All costs, timing, and amounts were developed by the specialists on the project's interdisciplinary team. The expected revenue is the corresponding predicted high bid of $50 per CCF. The predicted high bid is used for the expected revenue (rather than the appraised stumpage rate) since the predicted high bid is the best estimate of the high bid resulting from the timber sale auction. The actual timber value will depend on the market when the timber is sold, and may be higher or lower than the predicted high bid. Present Net Value was calculated using PEAT, a program for economic analysis of long-term, on-the-ground resource management projects.

Table EC-12 indicates that the Alternative D is financially inefficient for the timber harvest and required design criteria, as well as for all activities, as indicated by the negative PNV. The PNV for the proposed action is negative $12.6 million for the timber harvest and required design criteria and negative $22.1million for all planned activities. As discussed above, there are many indirect effects which are not captured in the analysis of financial efficiency. Fuels treatments under this alternative would contribute to fuels conditions that would have more resistance to wildland fire. Treatments proposed under this alternative could reduce the threat to human life and decrease wildland fire related costs such as property loss, lost revenues and suppression costs. If treatments proposed under this alternative successfully prevented even one fire similar in size and severity as the Wesley Fire, the PNV of these restoration activities would be significantly less negative.

Employment & Labor Income Impacts

Economic impacts, in terms of employment and labor income, associated with the Lost Creek-Boulder Creek Restoration Project activities (timber harvest, restoration activities, road work, and recreation improvements) are estimated with the IMPLAN input-output model described above.

Commercial forest products: While there is potential to harvest between 33 and 82 mmbf of sawtimber and 41,000-100,000 tons of biomass under Alternative D, it is anticipated that 53 mmbf of sawtimber and 12,927 tons of biomass would be harvested. The harvesting and processing of these commercial forest products would support 38 jobs and $1.3 million in local labor income on annual average. In addition to the employment and income contributions of logging and processing, the thinning, remove or machine piling, biomass removal, and regeneration planning associated with these commercial forest products would support an additional 3 jobs and $63,000 in labor income on annual average over the life of the project. This analysis assumes the timber would be processed within the designated impact area. However, if some of the timber were processed outside the region, then a portion of the jobs and income would be lost by this regional economy.

Recreation related improvements: Although treatments will likely create noise, dust, and smoke which may negatively affect the short-term quality of recreational experiences within the project one treatment days, proposed treatments are not anticipated to effect overall forest visitation. As section 4.6 of the National Visitor Use Monitoring (NVUM) surveys for the forests demonstrate, when individuals are unable to visit their preferred site, most will engage in substitute behavior that will continue to have an effect in the local economy (USFS 2011a, USFS 2011b). As a result, treatments considered under Alternative D are not expected to measurably reduce the economic contributions of recreation within the study area.

However, Alternative D does propose to build several new restrooms and camp sites near the reservoir and to make trail improvements which would increase the quality of recreational experiences. Recreationists will benefit from the higher quality of recreational experiences supported by the project area, and will

likely result in higher non-market values associated with Lost Creek-Boulder Creek Project area lands. The construction of new and improvement to existing recreation related facilities will also generate new work for private contracting and U.S. Forest Service force labor. The recreation improvements included in this alternative would support a portion of 1 job and approximately $14,000 in labor income in the local economy on annual average over the life of the project.

Restoration activities: Restoration activities proposed under Alternative D would include commercial and non-commercial vegetation treatments, but this alternative includes more intense treatments on a greater number of acres. Treatments under this alternative include prescribed burning, thinning, and noxious weed control. These activities will be implemented using a combination of contract and Forest Service force labor and are estimated to support 31 jobs and approximately $794,000 in labor income across the three-county impact area on annual average over the next 10 years.

Road work: While some road work will be associated with the commercial harvesting of forest products, Alternative D proposes additional road work to improve, maintain, and decommission roads within the project area. Additional road work associated with gravel, aquatic organism passages, and wildlife enclosures are proposed under this alternative. Forest specialists have indicated that the majority of road work would be contracted out to firms operating out of the three-county impact area. Road work proposed under this alternative is estimated to support 5 jobs and $121,000 in labor income across Adams, Idaho and Valley counties on annual average over the life of the project.

IMPLAN estimates all activities proposed under Alternative D would support approximately 77 jobs (direct, indirect and induced) and nearly $2.3 million in local labor income (direct, indirect and induced) on annual average over the life of the project (Tables EC-9 and EC-10). Since the expenditures occur over a 10-year period, the estimated impacts of jobs and labor income would be spread out over the life of the project. These are not new jobs or income, but rather jobs and income that can be attributed to activities carried out by this restoration project.

Cumulative Effects

Ecological benefits and economic impacts from the Lost Creek-Boulder Creek Restoration Project would accrue over the life of the project. As shown in table 15, the commercial forest products, recreation related improvements, restoration activities, and road work associated with Alternative D would support a total of 780 jobs and more than $23.5 million in local labor income over the 10 years activities are proposed.

Table EC-15. Cumulative Effects of Alternative D

Proposed Activities	Jobs	Income ($1,000's)
Commercial Forest Products		
Logging and Processing	385	$ 13,592
*Associated activities**	30	$ 625
Recreation	6	$ 143
Restoration	310	$ 7,941
Road Work	49	$ 1,212
Total Contribution	780	$ 23,513

Alternative E

The Payette NF proposes to implement restoration treatments over a 10 year period (except for prescribed burning, which will be carried out over approximately 20 years) to restore the structure and function of forests and watersheds within the Lost Creek Boulder Creek area. Alternative E is designed to respond to comments that question the cost of the project compared to the projected economic and restoration benefits. Alternative E drops some of the more expensive treatments, while attempting to retain restoration goals of the proposed action.

Financial Efficiency

As discussed above, the PNV is the discounted sum of benefits minus discounted costs associated with each scenario. The financial efficiency analysis is specific to the timber harvest and ecosystem management associated with the project (as directed in Forest Service Manual 2400–Timber Management and guidance found in the Forest Service Handbook 2409.18). Costs for sale preparation, sale administration, regeneration, and ecosystem restoration are included. All costs, timing, and amounts were developed by the specialists on the project's interdisciplinary team. The expected revenue is the corresponding predicted high bid of $50 per CCF. The predicted high bid is used for the expected revenue (rather than the appraised stumpage rate) since the predicted high bid is the best estimate of the high bid resulting from the timber sale auction. The actual timber value will depend on the market when the timber is sold, and may be higher or lower than the predicted high bid. Present Net Value was calculated using PEAT, a program for economic analysis of long-term, on-the-ground resource management projects.

Table EC-12 indicates that Alternative E is financially inefficient for the timber harvest and required design criteria, as well as for all activities, as indicated by the negative PNV. The PNV for the proposed action is negative $11.3 million for the timber harvest and required design criteria and negative $17 million for all planned activities. As discussed above, there are many indirect effects which are not captured in the analysis of financial efficiency. Fuels treatments under this alternative would contribute to fuels conditions that would have more resistance to wildland fire. Treatments proposed under this alternative would reduce the threat to human life and decrease wildland fire related costs such as property loss, lost revenues and suppression costs. If treatments proposed under this alternative successfully prevented even one fire similar in size and severity as the Wesley Fire, the PNV of these restoration activities would be significantly less negative.

Employment & Labor Income Impacts

Economic impacts, in terms of employment and labor income, associated with the Lost Creek-Boulder Creek Restoration Project activities (timber harvest, restoration activities, road work, and recreation improvements) are estimated with the IMPLAN input-output model described above. Timber production, restoration activities, road work, and recreation improvements from this project would have direct and indirect effects on local jobs and labor income.

For timber harvest, the direct employment and labor income response coefficients (e.g., jobs and labor income per million cubic feet) were derived by the University of Montana's Bureau of Business and Economic Research. The indirect and induced multiplier effects were estimated using the IMPLAN model for the three-county impact area. For restoration, road work, and recreation improvements, the direct, indirect and induced effects were derived using IMPLAN.

Commercial forest products: While there is potential to harvest between 33 and 70 mmbf of sawtimber and 41,000-85,000 tons of biomass under Alternative E, it is anticipated that 48.3 mmbf of sawtimber and 5,892 tons of biomass would be harvested. The harvesting and processing of these commercial forest products would support 35 jobs and $1.2 million in local labor income on annual average. In addition to the employment and income contributions of logging and processing, the thinning, remove or machine piling, biomass removal, and regeneration planning associated with these commercial forest products would support an additional 3 jobs and $59,000 in labor income on annual average over the life of the project. This analysis assumes the timber would be processed within the designated impact area. However, if some of the timber were processed outside the region, then a portion of the jobs and income would be lost by this regional economy.

Recreation related improvements: Although treatments will likely create noise, dust, and smoke which may negatively affect the short-term quality of recreational experiences within the project one treatment days, proposed treatments are not anticipated to effect overall forest visitation. As section 4.6 of the National Visitor Use Monitoring (NVUM) surveys for the forests demonstrate, when individuals are unable to visit their preferred site, most will engage in substitute behavior that will continue to have an effect in the local economy (USFS 2011a, USFS 2011b). As a result, treatments considered under Alternative C are not expected to measurably reduce the economic contributions of recreation within the study area.

However, Alternative E does propose to build several new restrooms and camp sites near the reservoir and to make trail improvements which would increase the quality of recreational experiences. Recreationists will benefit from the higher quality of recreational experiences supported by the project area, and will likely result in higher non-market values associated with Lost Creek-Boulder Creek project area lands. The construction of new and improvement to existing recreation related facilities will also generate new work for private contracting and U.S. Forest Service force labor. The recreation improvements included in this alternative would support a portion of 1 job and approximately $14,000 in labor income in the local economy on annual average over the life of the project.

Restoration activities: Alternative E drops some of the more expensive treatments, while attempting to retain restoration goals of the proposed action. Treatments under this alternative include prescribed burning, thinning, and noxious weed control. These activities will be implemented using a combination of contract and Forest Service force labor and are estimated to support 23 jobs and approximately $593,000 in labor income across the three-county impact area on annual average over the next 10 years.

Road work: While some road work will be associated with the commercial harvesting of forest products, Alternative E proposes additional road work to improve, maintain, and decommission roads within the project area. Additional road work associated with gravel, aquatic organism passages, and wildlife enclosures are proposed under this alternative. Forest specialists have indicated that the majority of road work would be contracted out to firms operating out of the three-county impact area. Road work proposed under this alternative is estimated to support 3 jobs and $83,000 in labor income across Adams, Idaho and Valley counties on annual average over the life of the project.

IMPLAN estimates all activities proposed under Alternative E would support approximately 64 jobs (direct, indirect and induced) and nearly $1.9 million in local labor income (direct, indirect and induced) on annual average over the life of the project (Tables 9 and 10). Since the expenditures occur over a 10-year period, the estimated impacts of jobs and labor income would be spread out over the life of the project.

These are not new jobs or income, but rather jobs and income that can be attributed to activities carried out by this restoration project.

Cumulative Effects

Ecological benefits and economic impacts from the Lost Creek-Boulder Creek Restoration Project would accrue over the life of the project. As shown in table 16, the commercial forest products, recreation related improvements, restoration activities, and road work associated with Alternative E would support a total of 650 jobs and more than $19.8 million in local labor income over the 10 years activities are proposed.

Table EC-16. Cumulative Effects of Alternative E

Proposed Activities	Jobs	Income ($1,000's)
Commercial Forest Products		
Logging and Processing	351	$ 12,390
*Associated activities**	28	$ 592
Recreation	6	$ 143
Restoration	232	$ 5,928
Road Work	34	$ 833
Total Contribution	650	$ 19,886

Chapter 4 – Consultation and Coordination

4.1 Summary of Scoping and Public Involvement to Date

Opportunities for the public to participate in and help shape this project have been considerable. This Project was first listed on the Payette National Forest's Schedule of Proposed Actions (SOPA) in July, 2012, and scoping letters, project description and other project information were posted on the Payette National Forest public website at http://www.fs.usda.gov/land/payette/landmanagement.

Initial scoping for this project occurred on February 22, 2013. Scoping letters requesting comments were sent to approximately 312 local, state, and federal agencies, individuals and organizations. The complete mailing list is in the project record. Legal notices were published in the Idaho Statesman (the legal paper of record) on February 27, 2013, the Adams County Record on February 27, 2013, and the McCall Star-News on March 7, 2013.

The PFC is a collaborative group formed under the Omnibus Public Land Management Act of 2009 (PL 111-11) and whose recommendations are structured to meet the intent of the Collaborative Forest Landscape Restoration Act (CFLRA). The PFC members represent stakeholders from a broad range of interests, including the environmental community, timber industry, recreational groups, and state and county government. The purpose of the Collaborative Forest Landscape Program is to encourage the collaborative, science-based ecosystem restoration of priority forest landscapes. The PFC has held regular meetings and seasonal field trips since 2009. The Payette National Forest has participated in these meetings upon request of the PFC. This project is based in part on recommendations provided by the PFC to the Forest Supervisor on January 25, 2013.

A Notice of Intent (NOI) to prepare an environmental impact statement was published in the Federal Register on February 25, 2013. The New Meadows Ranger District hosted a public meeting to gather input on the project on March 20, 2013. In attendance were members of the PFC, a local natural resource committee representative, local residents, an Adams County Commissioner, timber industry representatives, Idaho Department of Lands employee, and members of motorized recreation associations. The project concept was introduced and the Forest Service received feedback from those in attendance.

The Forest Service introduced this project to the Shoshone-Paiute leaders during Wings and Roots Program meeting (government to government consultation) on April 12, 2012. Updates were provided to the Shoshone-Paiute leaders during Wings and Roots Program meetings on December 13, 2012, February 14, 2013, April 11, 2013, June 14, 2013, and August 14, 2013. The Forest Service presented the proposed action to the Nez Perce Staff on March 6, 2013. Updates were provided to the Nez Perce Staff on June 5, 2013 and September 4, 2013. The proposed action was presented to the Shoshone-Bannock Tribe on September 11, 2013.

Several site visits have occurred with the Level 1and Level 2 teams (U.S. Fish and Wildlife Service and NOAA Fisheries personnel) within the project boundaries. On February 28, 2013, Forest Service representatives presented specific proposed project activities to U.S. Fish and Wildlife Service and NOAA Fisheries personnel at a scheduled Level 1 meeting. The first site visit occurred with the PFC and the Level 2 members on July 27, 2012 during the National Forest Management Act (NFMA) stage. A

site visit for the Level 1 team occurred on June 18, 2013. A follow up visit for the Level 1 members to view recreation sites occurred on August 19, 2013.

Multiple visits to the Adams County Commissioners and the Adams County Natural Resources Committee have been made. Briefings on the status of the project as well as opportunities for public involvement have been presented to the Adams County Commissioners on January 14, March 18, May 20, June 17, August 12, and September 16, 2013. On February 25, 2013, the proposed project was presented to the Natural Resources Committee and members of the public.

4.2 Agencies, Organizations, and Individuals Consulted during the Planning Process

Agencies

Adams County Board of Commissioners
Idaho Department of Environmental Quality
Idaho Department of Fish and Game
Idaho Department of Lands
Idaho Department of Parks and Recreation
NOAA Fisheries
U.S. Fish and Wildlife Service
U.S. Environmental Protection Agency

Organizations

Alliance for the Wild Rockies
American Forest Resource Council
Adams County Natural Resource Committee
Backcountry Horsemen
Backcountry Recreation Club
Boise Cascade
Cabin Creek
Circle C Homeowners Association
Evergreen Forest
Idaho Forest Group
Idaho Conservation League
Mahon Logging
Meadow Creek POA
Payette Forest Coalition
Osprey Environmental Solutions
Rocky Mountain Elk Foundation
Spatial Interest
Secsesh Wildlands
The Wilderness Society
Trout Unlimited

West Central Highlands RC and D
Woody Biomass Utilization Partnership

Individuals
Al Becker
Becky Johnstone
Dick Artley
Glen Jacobsen
Hayden Clairborne
Jean Public
Ken Riggs
Peter Walker
Richard Olsen
Rodger Nelson
Ron Hamilton

4.3 American Indian Tribal Governments

Nez Perce Tribe

Shoshone Bannock Tribes

Shoshone Paiute Tribes

4.4 List of Preparers

The following individuals were participants in preparing the Draft Environmental Impact Statement. They are listed alphabetically by first name. The Core Team members developed the Draft Environmental Impact Statement to facilitate implementation of the Lost Creek Boulder Creek Landscape Restoration Project. The Extended Team members and Management and Review members listed below are those individuals that provided significant contributions to the Core Team through consultation, leadership, analysis or review.

Core Team

Chans Obrien	Geographical Information Systems Data Analysis and Cartography
Dustin Doane	Fire and Fuels Management
Holly Hutchinson	NEPA Coordinator/team leader
Jane Cropp	Recreation and Visual Quality
Jason Greenway	Fisheries
Ken Meyers	Acting NEPA Coordinator/team leader/writer/editor
Leigh Bailey	Hydrology and Soils
Mickey Pillars	Geographical Information Systems Data Analysis and Cartography

Mike Dixon	Transportation planning
Paul Klasner	Forested Vegetation
Russ Richards	Wildlife

Extended Team

Alma Hanson	Botany
Brian McMorris	Invasive Species and Livestock Management
Donna Reed	Invasive Species and Livestock Management
Eric Whiteman	Cultural Resources
Gayle Dixon	Cultural Resources

Management and Review

Ana Egnew	Forest Wildlife Biologist
Brian Harris	Public Affairs Officer
Clayton Naylor	Forest Fisheries Biologist
Dave Kennel	Forest Hydrologist
George Panek	Natural Resources Staff Officer
Jake Strohmeyer	Recreation, Engineering, Archeology, Lands, and Minerals Staff Officer
Kim Johnson	Forest Silviculturist
Kim Pierson	New Meadows District Ranger
Pattie Soucek	Forest Planning Staff Officer
Sue Dixon	Forest NEPA Coordinator
Susan Miller	Forest Ecologist

Appendices

Appendix A - Riparian Conservation Area Treatments 3
Appendix B - Northern Idaho Ground Squirrel Emphasis Areas 7
Appendix C - Cumulative Effects 9
Appendix D - Project Area Roads and Special Uses Management 17
Appendix E – Monitoring and Modeling Forms 32
Appendix F - Legal and Regulatory Requirements 50
Appendix G - References 56
Appendix H- Glossary and Acronyms 84

This page left deliberately blank.

Appendix A - Riparian Conservation Area Treatments

Delineation of Riparian Conservation Areas

Riparian Conservation Areas (RCAs) are stream and wetland protection zones delineated for the protection of riparian-dependent resources. Management activities are subject to specific Forest Plan goals, objectives, standards, and guidelines. RCAs include traditional riparian corridors, perennial and intermittent streams, wetlands, lakes, springs, reservoirs, and other areas where riparian functions and ecological processes are crucial to maintenance of the area's water quality, sediment regime, large woody debris, nutrient delivery system, and associated biotic communities and habitat.

Appendix B of the Forest Plan outlines a step-down process for delineation of RCAs on perennial and intermittent streams, ponds, lakes, reservoirs, and wetlands (USDA Forest Service 2003). The RCAs within the project area have been identified utilizing Option 2 (Forest Plan page B-34) delineation method. Forest Plan Option 2 provides a more specific delineation of an RCA boundary using site potential tree heights.

Field reconnaissance and stand exam data has indicated that Potential Vegetation Groups (PVGs) 2, 5, and 6 are the dominant PVGs in forested areas within the proposed activity units in the project area. RCA widths in forested areas will be based on the PVG 2 and PVG 6 site potential tree height of 120 feet (Forest Plan page B-36). RCA widths that will be used for this project are displayed in the following table:

Table A-1. Project Area RCA Widths

Water Source	RCA Width
Perennial Forested Streams (and intermittent streams providing seasonal rearing and spawning habitat)	240 feet (two site-potential tree heights) from the ordinary high water mark
Intermittent Forested Streams	120 feet (one site-potential tree height) from the ordinary high water mark
Ponds, Lakes, Reservoirs, and Wetlands	120 feet (one site-potential tree height) from the ordinary high water mark
Non Forested Streams (perennial and intermittent)	The extent of the flood prone width, or riparian vegetation, whichever is greater.

The current model identifies 16,250 acres within RCAs in the project area. Based on implementation of other projects, unmapped streams and other water sources are typically discovered during layout and implementation. Increases in RCAs acres are generally an additional 15 to 30 percent.

Need for Treatment

Initial project area analysis indicates approximately 12,600 acres of vegetative treatments (*i.e.* thinning and prescribed burning) in the RCAs would be needed to maintain or move towards the desired vegetative conditions as specified in Appendix A of the Forest Plan. This initial review indicated that approximately 6,100 acres of mechanical treatments in RCAs would aid in improving or maintaining the desired vegetative conditions. The remaining 6,500 acres would need to have prescribed fire applied to maintain the desired conditions. Based on Forest Plan management direction and other resource concerns a more detailed approach has been applied to

develop an RCA treatment proposal that is consistent with management direction, including Appendix B of the Forest Plan and the Aquatic Conservation Strategy (ACS).

Proposed Treatments in RCAs

Based on the purpose of the project and need to treat vegetation in RCAs, both mechanical and prescribed fire treatments are proposed in the RCAs. RCA vegetation treatments are not proposed in the Boulder Creek subwatershed.

Commercial Thin

Commercial thinning treatments are intended to move upland vegetation within RCAs toward the desired conditions described in the Forest Plan while maintaining soil, water, riparian and aquatic resources. Treatments would be designed to ensure that project activities do not degrade current RCA conditions and do not retard the attainment of SWRA desired conditions. All RCA treatments would apply only to upland vegetation that occurs within the outer portion of a RCA, and not to riparian vegetation (i.e. – willow, spruce). This action, on a site specific basis, is consistent with direction for upland vegetation desired conditions and RCAs in Forest Plan Appendices A and B (USDA Forest Service 2003).

RCA treatments would be limited to thinning where at least 30 percent canopy closure would be retained and would be developed in consultation with the district fish biologist and/or hydrologist to ensure streambank stability, ground cover are considered and riparian function is maintained.

In portions of RCAs where mechanical treatments would not be feasible or deleterious effects to riparian functions and ecological processes (described in the Forest Plan, page B-37) are anticipated, the unit (or portion(s) thereof) would be excluded from treatment.

Generally, mechanical disturbance in RCAs would be avoided. Due to the site specificity of each proposed RCA treatment unit, a map and description of the layout of the RCA portion of the unit would be provided to the District fisheries biologist, hydrologist,(or qualified designees)for field verification.. A site specific plan would be approved by a District hydrologist and fisheries biologist prior to implementation.

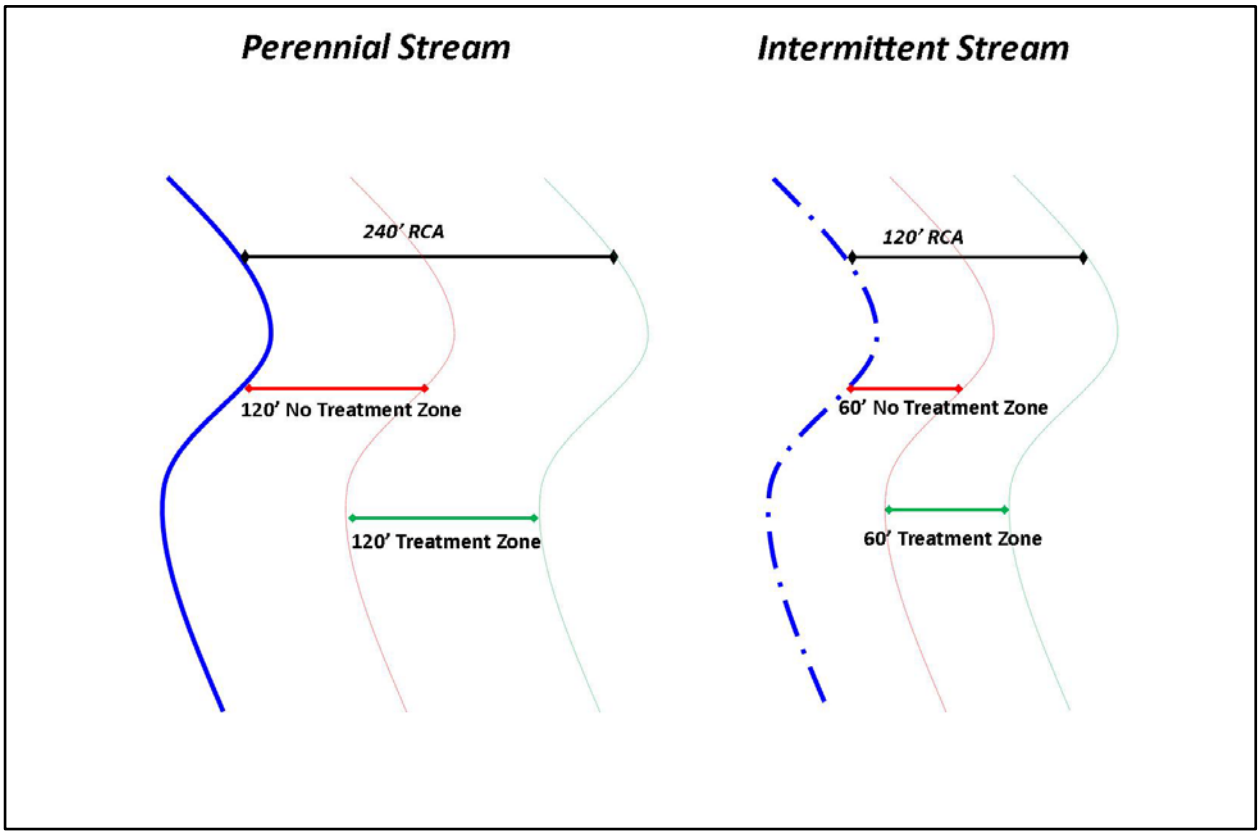
The following guidelines would be used for RCA treatment layout and implementation (see project Design Features, Table 2-5):

1. Only upland vegetation in the outer portion of the RCA would be treated (Figure A-1).
2. Along intermittent streams, thinning and limited equipment use could only occur in the outer 60 feet of the RCA. No cutting of vegetation would occur within 60 feet of the stream (Figure A-1).
3. Along perennial streams, thinning and limited equipment use could only occur in the outer 120 feet of the RCA. No cutting of vegetation would occur within 120 feet of the stream (Figure A-1).
4. No harvesting would be allowed in the no-cut zones. Cutting of individual trees within the no-cut zone may be approved on a case by case basis but removal of that material would not be permitted.
7. If unidentified RCAs are discovered during layout or implementation, they may be treated if: 1) they meet intent of RCA treatments; 2) all project design features and restrictions can be adhered to; and 3) they meet the following criteria:
    a) They fall outside of the Boulder Creek drainage and the Pony Creek RNA;
    b) The area is proposed for treatment but was identified during the layout/implementation phase of the project;

c) In PVG 1 and 2 – the existing canopy closure of forested areas within the stand is greater than 65 percent.

d) In PVG 5 and 6 – the existing canopy closure of the stand is greater than 70 percent.

Figure A-1. RCA Treatment and Stream Buffer Guidelines.



Non-Commercial Thinning

Non-commercial thinning in RCAs is not proposed in the Boulder Creek subwatershed, non-commercial thinning would not occur within 240 feet of perennial streams or within 120 feet of intermittent streams. Elsewhere in the Project Area, non-commercial thinning would be permitted within RCAs in accordance with the description of commercial RCA treatments above. Where non-commercial RCA thinning is proposed, it would not occur within 120 feet of perennial streams and not within 60 feet of intermittent streams (Figure A-1).

Prescribed Fire and Ladder Fuel Treatments

No prescribed fire treatments (direct ignition or ladder fuel treatments) would occur within RCAs in the Boulder Creek subwatershed. In the remaining portions of the Project Area, ignition operations within RCAs shall be implemented to maintain RCA function and processes by creating a mosaic of burned and unburned areas, minimizing severity and intensity; maintaining stream-shading vegetation; retaining adequate ground cover and sediment filtering capacity; and maintaining current and recruitable large and coarse woody debris. In RCAs identified for treatment, no ignitions within 120 feet of perennial stream channels or within 60 feet of intermittent

stream channels will occur. Ignition operations should generally only occur in the outer portions of RCAs in the drier PVGs where fuels reduction is needed to increase the resiliency of the RCA and reduce the potential for high intensity/severity wildfire. If any areas are not capable of carrying fire or maintaining RCA function and processes (as described above) at the time of fire application, fire will not be applied.

Ladder fuel treatments conducted as part of prescribed burning activities may be implemented to protect the overstory from effects of prescribed fire and to meet prescribed fire objectives. Ladder fuel treatments- would only occur in RCAs where active ignition is anticipated and would not occur within riparian vegetation, within 60 feet of intermittent channels or within 120 feet of perennial stream channels. All ladder fuel treatments in RCAs will be completed by hand and would not cut trees larger than 8 inches DBH. Slash produced from ladder fuel treatments will be lopped and scattered. Piling of slash will not occur within RCAs.

All burn plans and anticipated ladder fuel treatments will be annually reviewed by District Resource Specialists (fisheries biologist, wildlife biologist and hydrologist). Additional site-specific concerns regarding prescribed fire treatments (including RCA treatments) will be addressed at that time.

Appendix B - Northern Idaho Ground Squirrel Emphasis Areas

Background and Direction for Northern Idaho Ground Squirrel Treatments

The following proposal was developed based on the Northern Idaho Ground Squirrel (NIDGS) Recovery Plan and NIDGS Technical Working Group recommendations.

Restore and Maintain Habitat

Thinning, burning, reseeding, and other measures are necessary management tools for habitat restoration and maintenance. The following management tools and sociological considerations should be used to create the habitat at appropriate stages of ecological succession:

Development of site-specific management plans for primary metapopulation sites

- Consider compatible human uses;
- Assess potential forestry practices;
- Conduct plant community composition analysis

Restoration of habitat

- Thinning and burning
- Reseeding with native grass and forb species;
- Livestock management

Maintenance of appropriate habitat

- Prescribed burning at site-specific intervals;
- Vegetation management (*e.g.*, noxious weed control);
- Grazing regimes appropriate to each site

Priority areas for NIDGS emphasis treatment have been developed and divided into two types. Priority one (P1) areas are areas within ¼ mile of occupied habitat and within US Fish and Wildlife Service (USFWS) recovery plan metapopulation areas. Priority two (P2) areas are based on potential habitat that could link meta-populations to increase and maintain genetic diversity within the known populations. Approximately 12,100 acres of P1 and 11,600 acres of P2 areas have been identified.

Within the P1 areas, approximately 4,900 acres of mechanical treatments are proposed. Within these NIDGS priority areas, the objective of these treatments would be as described in the Vegetation Treatments section of this document. The treatment objectives should be designed to move vegetation toward the desired conditions specified in Appendix A of the Forest Plan. The following additional direction should be applied to treatments in the NIDGS priority areas.

NIDGS objectives in P1 areas

1. Prioritize the timing of treatments in these areas to be as soon as practical (i.e. treat these areas first).
2. Manage areas immediately adjacent to occupied sites toward the low end of desired canopy closures (i.e. – average canopy closures should typically be between 15-30 percent in these areas).

3. Emphasize forage production for NIDGS. This can typically be accomplished by managing for frequent (return interval 3-7 years), low intensity disturbance (i.e. – prescribed fire).
4. Identify potential corridors for connecting occupied sites. Manage portions of these stands to encourage dispersal and exchange of individuals. (i.e. – reduce canopy closure to near 10-20 percent mostly in PVG 2, but sometimes in PVG 5 in corridor areas). Work with wildlife staff (utilizing NIDGS Recovery Plan and NIDGS technical team recommendations) to determine appropriate corridor location and spatial arrangement.

NIDGS objectives in P2 areas

1. Identify suitable habitat within one quarter mile of known populations and treat to improve habitat.
2. Encourage geographic growth of metapopulations toward other known populations and high quality habitat.
3. Treatments in currently unoccupied habitat should be designed to achieve low to moderate canopy closure.

Appendix C - Cumulative Effects

Past, present, and reasonably foreseeable projects and activities within the following 5th and 6th field hydrologic unit codes (HUCs) were compiled to be considered in the cumulative effects analysis completed for this project:

5th Field HUCs:

- Lower Little Salmon River
- Beaver Creek – Weiser River
- West Fork Weiser River

6th Field HUCs:

- Boulder Creek
- Upper Weiser River
- Lost Creek
- Upper West Fork Weiser River
- Lower West Fork Weiser River
- Warm Springs Creek – Weiser River
- Gaylord Creek – Weiser River

Some of the activities listed in the table may be outside the cumulative impact areas analyzed by individual resource areas and, therefore, may not be considered in every resource-specific analysis. Conversely, some cumulative impact analysis areas may extend well past the cumulative effects area used to compile the list below, and, thereby, could have additional activities specified in the resource specific technical reports (e.g. air quality). The narrative below and Table A-2 identify the past, present / ongoing, and reasonably foreseeable projects which may be considered in each resource analysis.

Actions/Events that May Contribute to Cumulative Effects

1997 Floods: "Snow, rain, and record high temperatures during the last week of December 1996 and the first few days of the New Year produced record flooding and landslides on the Payette National Forest. December precipitation ranged from 280% in the Salmon River Basin to 300% in the Weiser, Payette, and Boise River basins. In the mountain community of McCall, December precipitation totaled 9.8 inches, the highest single month ever recorded. From December 23, 1996 to January 2, 1997, total precipitation was 7.8 inches with 1.6 inches falling in a 24-hour period on January 2, 1997. Rain on snow caused rapid melting of snow and high runoff. Soils were saturated, resulting in landslides and debris flows throughout much of the Forest. Landslides have exposed bare soil, which is subject to additional erosion. Floodwaters and debris flows traveled down stream channels, plugged culverts, and washed out across roads. Stream channels have been altered by migrating laterally and downcutting. Streambanks have lost protective riparian vegetative cover. Several stream channels are clogged with debris." (USDA Forest Service. 1997a "Emergency Watershed Protection Program Report – 1997 New Year's Flood." Payette National Forest)

Within the Little Salmon subbasin, especially at the lower elevations, the effects of this flood event were great. The effects were caused dominantly by slumps and debris avalanches that affected fillslopes, cutslopes, running surfaces, and culverts on roads and contributed to large flows of water and debris in the Little Salmon River and tributaries, especially below (north of) Round Valley. The effects were heavily concentrated within those elevations near the snowline at the time of the precipitation and temperature events.

Impacts associated with the storm events isolated the area from approximately Smokey Boulder Road to Pinehurst on State Highway 95. The Little Salmon River was scoured throughout much of this stretch with downcutting, lateral movement of the River, and loss of riparian vegetation resulting. Portions of Highway 95 were demolished and many residences along the river were partially or totally destroyed. Debris avalanches and slumps are evident in this section of the Little Salmon River.

Personal Use Firewood and Other Personal Use Forest Products Collection: Access for collection of forest products for personal use occurs throughout the project area. Collection of some forest products requires a permit e.g. firewood, plants, mushrooms.

Flow Diversion: A number of water diversions are authorized or have applications for ditch bill easements occur on forest lands in the cumulative effects area.

Introduction of Exotic Fish Species. Introduced non-native fishes within the project area affect native species by competing for food and spawning/rearing habitat. Adult non-native fish species may also consume young of the year and juvenile native species. In addition, exotic species may hybridize with native species (especially introduced brook trout with native bull trout). Competition and hybridization can reduce viability of, and potentially eliminate local populations of native fish species.

NIDGS Habitat Improvement Projects: Several habitat improvement projects have occurred on the New Meadows District near the project area. Projects have occurred near Lost Valley Reservoir and Price Valley Guard Station. Implementation of these projects (thinning and prescribed burning) and monitoring is ongoing. Results have shown an increase in NIDGS at both sites. Additional projects will be implemented that will improve NIDGS habitat in both areas. All projects are expected to improve forage and habitat and link colonies to improve the breeding success.

Noxious weeds: Noxious weeds located in the Lost Creek Boulder Creek Landscape Restoration project cumulative effects area include Canada thistle, yellow toadflax, sulfur cinquefoil, and St. Johnswort. A majority of the infestations observed were associated with ground disturbance activities from livestock grazing, roads, and timber sale activities. Noxious weed treatment is accomplished through integrated pest management using mechanical, biological, and chemical means of control.

Other Agency & Private Lands: The cumulative effects area includes private lands, Bureau of Land Management (BLM), and State of Idaho lands. Over the past years, these lands were managed for timber production, agricultural use including farming, water diversion, and livestock grazing. The State of Idaho conducted several timber sales on Idaho Department of Lands tracts within the cumulative effects area. The BLM manages numerous special use permits, timber sales and recreation activities within or near the cumulative effects area (see Table A-2). The Potlatch Company owns several parcels of land on the eastern edge of the cumulative effects area.

The Tamarack sawmill site is adjacent to Highway 95 between the Price Valley and Lost Valley roads. The Weiser River National Recreation Trail is a popular recreation trail, following the former right-of-way of a Union Pacific Railroad line between Tamarack and the town of Weiser.

Bally Mountain Project – BLM cottonwood. BLM timber sales south of Hazard Creek and west of Hard Creek on east side of Highway 95. The Bally North project planned start is 2014, Bally South currently being prepped. This project includes timber harvest and prescribed fire.

Past Fires Suppression: Forests that once burned at frequent intervals, like the majority of the stands in the cumulative effects area, have been prevented from burning for more than a century by fire suppression. Fires suppression has generally been effective for one to four fire cycles and has allowed the development of denser, multi-storied forests on more of the landscape. While the fire regime in the cumulative effects area is a mix of lethal, mixed, and non-lethal, the relative proportions of fire types has shifted from low-intensity surface fires to more severe crown fires. Severe fires are now more likely to occur on more of the landscape than they would have historically (Brown 2000), affecting a condition class change in the cumulative effects area.

All wildfires in the cumulative effects area have been actively suppressed since the early 1900s. The Payette NF GIS fire history layer shows 496 small fire occurrences and five recent larger fires (10 acres and above). The largest fire in recent history, the Wesley fire, occurred in 2012 and burned 16,000 acres within the cumulative effects project area.

In areas not treated by timber harvest, the lack of wildfire within most of the cumulative effects area has contributed to increased surface fuel loads and tighter tree spacing than would have occurred historically.

Past Road Construction: Most of the past road construction in the cumulative effects area occurred as a result of timber harvest. On private ground roads have been constructed for both land management activities and access.

Past Timber Harvest: Table A-2 lists past timber sales and associated activities within the cumulative effects area. This data is pulled from the FACTS corporate data set and does not include some timber sales, primarily prior to 1950. The current Payette NF Geographic Information System (GIS) vegetation layer delineates areas based on detectable past timber harvest and is a good proxy for estimating area still showing impacts from past activities. Many resource areas use this GIS vegetation layer to assess cumulative impacts.

Range allotment management and historic livestock use: Sheep and cattle grazing have taken place in the area for the last 100 years. Historically, all allotments in the cumulative effects area were fully stocked. An estimated 100,000 to 200,000 sheep annually passed over the Salmon River driveway, west of the Little Salmon River. In 2010 the Payette Forest Plan was amended reducing the number of acres suited for domestic sheep and goat grazing. As a result of that amendment the number of domestic sheep grazed has been reduced.

The cumulative effects area is within the following allotments:

- Warm Springs Cattle Allotment
- Price Valley Sheep Allotment
- Round Valley Cattle Allotment
- Smith Mountain Sheep Allotment
- North Hornet Cattle Allotment
- Boulder Creek Sheep Allotment (currently unsuited for domestic sheep and goat grazing)

Range-related Past Projects in Analysis Area

- Bear Wallow Aspen Regeneration Project

- Salmon River Stock Driveway Rehabilitation Project
- NIDGS Interpretation Site
- "Gully Plug" Stabilization in Boulder Creek Allotment
- Lost Creek Exclosure CE (Wildlife Viewing Area)

Recreational Use: Recreational use with the cumulative effects area is primarily dispersed. There are several trails, developed campgrounds, parking lots and bathroom facilities within the project area. ATV use is also popular throughout the project area, particularly around the Lost Valley Reservoir.

Road Maintenance and Construction: The project area currently has 473 miles of system roads. Most were constructed between the 1950s and the present, with major episodes of construction occurring in the 1960s and 1970s. Prior to the 1950s very few roads existed in the area. The vast majority of the roads were constructed for accessing timber harvest units. There are several roads analysis reports covering the cumulative effects area including a Travel Analysis Report completed in 2012 for the Lost Creek Boulder Creek Landscape Restoration project area. The recent Travel Analysis Report and past reports provide a review of the roads and recommendations on future road management in the area.

Routine road maintenance occurs on most open roads within the project area. Maintenance on gravel and native surface roads is mainly surface grading and culvert cleaning. Periodic replacement of gravel on road surfaces occurs when gravel wears out.

Special Uses: Two major power lines managed by Idaho Power traverse the southern third of the cumulative effects area, the Cambridge-McCall line and the Oxbow-McCall line. Idaho Power also is permitted use of 14.9 miles of road in support of these two power lines.

Travel Management Plan Revision: The Payette National Forest updated its Travel Management Plan for the Council and New Meadows Ranger Districts. The updated travel plan closed much of the cumulative effects area to cross country motorized travel and restricted OHV use to designated roads and trails. The Forest issues an annual MVUM (Motor Vehicle Use Map) to aid the public in determining trails designated motorized use.

Table A-2. Past, Present / Ongoing, and Reasonably Foreseeable Activities

Project / Activity	Date	In Project Area?
Past Culvert Bridge Replacement Activities		
Star Creek Culvert / Bridge Replacement	2010	Y
Road Decommissioning	1997-2010	Y
Past Transportation Management Activities		
Council & New Meadows Ranger Districts Snow-free Season Travel Management Plan	2009	Y
Past Reforestation Activities		
Beaver Creek	1963	N
Boat Ramp	1975	Y
Brush Mountain	2001	Y
Butter Gulch 77	1981	Y
Crawford	1998	Y
Dry Beaver	1971	N
Eddies Cleanup SSTS	1997	N
Fourth of July	1969	Y
Grouse Creek	1967	Y
Hall Fire Salvage	2004	N

Project / Activity	Date	In Project Area?
Hall Ridge	1993	N
Hotlicks	1999	Y
Huckleberry 61	1964	Y
Legacy Planting w/no sale name associated	1954 - 2000	Y
Longshot	1995	Y
Lookout	1970	Y
Lost Bear	1990	Y
Lost Boat	1991	Y
Lost Creek	1968	Y
Lost Lake Progeny Site	1976	Y
Lost Town	1989	Y
Lost Town	1998	Y
Lower Grouse	1996	Y
Lower Grouse 72	1975	Y
Lumpy's Cleanup SSTS	1997	N
Many LP SS	1986	Y
Oleo	1991	Y
Railroad Saddle	1976	Y
Raven Corral	1990	Y
Rock Creek	1972	Y
Rock Jack	1994	Y
Saddle	1992	Y
Sheep Creek	1967	Y
Sheep Weiser	1986	Y
Slaughter Gulch 67	1970	Y
Squirrelly Billy	2010	Y
State Sales	1980	Y
Switch	1993	Y
Town Creek	1989	Y
Town Creek Salvage	1989	Y
Triple Creek	1970	Y
Turkey	1990	Y
Upper Grouse	1978	Y
Upper Weiser	2010	Y
Wally's Salvage	1995	N
Weiser River Fuels	1988	N
West Butter Salvage	1988	Y
West Fork 68	1970	Y
Yantis Ditch	1981	Y
Yellow Jacket	1984	Y
Past Timber Stand Improvement Activities		
Beaver Creek	1984	N
Beaver Creek	2006	N
Boat Ramp	1992	Y
Brush Mountain	2001	Y
Butter Gulch 77	2003	Y
Dry Beaver	1996	N
East Lost Squirrel	2010	Y
Fourth of July	1986	Y
Fourth of July	1996	Y
Grouse Creek	1983	Y
Grouse Creek	1991	Y

Project / Activity	Date	In Project Area?
Joker Creek 72	2006	N
Legacy TSI w/no sale name associated	1965 -1999	Y
Lookout	1984	Y
Lost Boat	1991	Y
Lost Lake Progeny Site	1996	Y
Lost Squirrel	2002	Y
Lost Town	1998	Y
Lower Grouse 72	1996	Y
Railroad Saddle	1994	Y
Raven Corral	1991	Y
Rock Jack	1994	Y
Saddle	1991	Y
Sheep Creek	1985	Y
Sheep Weiser	1986	Y
Slaughter Gulch 67	1986	Y
Squatters	1993	Y
Switch	1993	Y
Topless	2006	Y
Triple Creek	1985 - 1996	Y
Upper Grouse	1985	Y
Wally's Salvage	1994	N
Weiser River Fuels	2011	N
West Fork 68	1983 - 1991	Y
Yellow Jacket	1987	Y
Past Vegetation Management Activities		
Beaver Creek	1962	N
Bird	1983	Y
Boat Ramp	1975	Y
Brush Mountain	2000	Y
Butter Gulch	1995	Y
Butter Gulch Salvage	1996	Y
Butter Gulch 77	1979	Y
Dry Beaver	1970	N
East Lost Squirrel	2010	Y
Final LP SS	1985	Y
Fourth Gulch	1977	N
Fourth of July	1967	Y
Hall Fire Salvage	2004	N
Hotlicks	1997	Y
Huckleberry 61	1963	Y
Landore Salvage	2003	N
Leave it to Beaver	1992	N
Legacy Harvest w/no sale name associated	1950 - 1996	Y
Lookout	1969	Y
Lost Bear	1989	Y
Lost Boat	1989	Y
Lost Creek	1967	Y
Lost Lake Progeny Site	1973	Y
Lost Squirrel	2005	Y
Lost Town	1996	Y
Lower Grouse	1995	Y
Lower Grouse 72	1974	Y

Project / Activity	Date	In Project Area?
Many LP SS	1984	Y
Oleo	1990	Y
Porcupine	1973	Y
Railroad Saddle	1974	Y
Raven Corral	1989	Y
Red Point	1979	N
Reservoir	1964	Y
Roadside Salvage	1981	Y
Rock Creek	1971	Y
Rock Jack	1993	Y
Saddle	1991	Y
Sheep Creek	1985	Y
Sheep Weiser	1985	Y
Slaughter Gulch 67	1967	Y
Slaughter Gulch 75	1975	Y
Slaughter Salvage	1983	Y
Squatters	1974	Y
Squirrelly Billy	2006	Y
State Sales	1975	Y
Switch	1993	Y
Switchback	1973	Y
Tordon Salvage	1985	N
Town Creek	1987	Y
Town Creek Salvage	1988	Y
Triple Creek	1969	Y
Tumble Tree	1991	Y
Turkey	1988	Y
Upper Grouse	1976	Y
Upper Lost	1995	Y
Upper Weiser	2006	Y
Vick Creek	1987	N
Wally's Salvage	1994	N
Weiser River Fuels	2011	N
West Butter	1983	Y
West Butter Salvage	1984	Y
West Fork 68	1969	Y
West Fork Face	1976	Y
Yantis Ditch	1980	Y
Yellow Jacket	1983	Y
IDL – Mosquito Skern	2009	N
IDL – Skern Ridge	2009	N
IDL – Price Pit	2011	N
IDL – Mudball	2011	N
IDL – Pine Ridge	2012	
Past Prescribed Fire Activities		
Underburn 97 acres	2009	
Underburn 118 acres	2011	
Underburn 1,024 acres	2010	
Underburn 1,449 acres	2012	
Past Large Wildfire Activity		
Sale Fire	1989	Y
Rock Jack	1996	Y

Project / Activity	Date	In Project Area?
Hall	2003	Y
North Star Butte	2004	Y
Wesley	2012	Y
Past Livestock Grazing		
Warm Springs Cattle Allotment	Ongoing	Y
Price Valley Sheep Allotment	Ongoing	Y
Round Valley Cattle Allotment	Ongoing	Y
Smith Mountain Sheep Allotment	Ongoing	Y
North Hornet Cattle Allotment	Ongoing	Y
Boulder Creek Sheep Allotment	2011	Y
Bear Wallow Aspen Regeneration Project	2010	Y
Salmon River Stock Driveway Rehabilitation Project	2010	Y
NIDGS Interpretation Site	Ongoing	Y
"Gully Plug" Stabilization Project, Boulder Creek Allotment	2010	Y
Lost Creek Exclosure – Wildlife Viewing Area	Ongoing	Y
Present / Ongoing Transportation System Including Roads and Road Maintenance Activities		
National Forest System Roads and Road Maintenance on MVUM Roads	Ongoing	Y
Other Jurisdiction Roads and Trails	Ongoing	
Present / Ongoing Vegetation Management Activities		
IDL – West Mud Salvage Ton	2013	N
Present / Ongoing Noxious Weed Treatment		
Payette National Forest Noxious Weed Program	Ongoing	Y
Cold Springs Campground	Ongoing	Y
Price Valley Winter Sports Parking Lot / Trailhead	Ongoing	Y
Facilities Management – Dispersed Recreation Sites	Ongoing	Y
Evergreen Campground	Ongoing	N
Lost Valley Reservoir Boat Ramp (managed by the Reservoir Association)	Ongoing	Y
Passages in Time Interpretation Site	Ongoing	Y
Lost Creek Riparian Area Interpretation Site	Ongoing	Y
Boulder Creek Dispersed Camping Area	Ongoing	Y
Reasonably Foreseeable Vegetation Management		
IDL – Island North	2015	N
IDL – Pine Slaughter	2015	N
Reasonably Foreseeable Special Use / ROW		
BLM - Indian Mountain Boulder Timber Project Road Acquisition	2015	N

Appendix D - Project Area Road Management

This appendix shows road management within the project area (Table D-1) and describes the gravel pits that will be used for used for road actions associated with project alternatives.

Table D-3. Road Management by Alternative.

Road Number	Operational Maintenance Level	Existing	Alternative B	Alternative C	Alternative D	Alternative E	Miles
50006	3 - SUITABLE FOR PASSENGER CARS	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.25
50006A	3 - SUITABLE FOR PASSENGER CARS	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.05
50012	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	TRAIL CONVERSION	DECOMMISSION	TRAIL CONVERSION	TRAIL CONVERSION	0.18
50063	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	1.68
50063	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	DECOMMISSION	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.46
50063	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.52
50074	3 - SUITABLE FOR PASSENGER CARS	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	13.52
50076	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.35
50079	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.55
50079	2 - HIGH CLEARANCE VEHICLES	OPEN	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.78
50079	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	3.91
50080	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.65
50080	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	3.92
50083	3 - SUITABLE FOR PASSENGER CARS	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.29
50083	3 - SUITABLE FOR PASSENGER CARS	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	9.03
50084	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	0.35
50089	3 - SUITABLE FOR PASSENGER CARS	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	9.68
50090	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	2.31
50090	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.43
50090	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.94
50091	4 - MODERATE DEGREE OF USER COMFORT	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.63
50093	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.46
50094	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.32
50097	3 - SUITABLE FOR PASSENGER CARS	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.12
50100	3 - SUITABLE FOR PASSENGER CARS	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.31
50101	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.38
50101	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	4.12

Road Number	Operational Maintenance Level	Existing	Alternative B	Alternative C	Alternative D	Alternative E	Miles
50101	3 - SUITABLE FOR PASSENGER CARS	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	4.62
50102	3 - SUITABLE FOR PASSENGER CARS	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	4.77
50115	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	3.80
50120	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	5.50
50120	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.47
50123	3 - SUITABLE FOR PASSENGER CARS	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	7.26
50126	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	3.18
50127		YEARLONG	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.28
50127	3 - SUITABLE FOR PASSENGER CARS	OPEN	MAINTAIN OR IMPROVE	DECOMMISSION	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.57
50127	3 - SUITABLE FOR PASSENGER CARS	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	5.37
50128	3 - SUITABLE FOR PASSENGER CARS	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	8.47
50131	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.84
50132	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	5.53
50135	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.78
50135	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	6.20
50136	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	4.99
50138	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.83
50139	3 - SUITABLE FOR PASSENGER CARS	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	11.12
50146	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	1.77
50146	3 - SUITABLE FOR PASSENGER CARS	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.26
50146	3 - SUITABLE FOR PASSENGER CARS	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.12
50153		SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.71
50153	3 - SUITABLE FOR PASSENGER CARS	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.42
50154	3 - SUITABLE FOR PASSENGER CARS	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	10.50
50155	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.51
50158	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.40
50158	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	DECOMMISSION	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	4.11
50158	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	3.04
50159	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	2.24
50188	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	0.87

Road Number	Operational Maintenance Level	Existing	Alternative B	Alternative C	Alternative D	Alternative E	Miles
50274	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	1.94
50274	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	1.93
50274	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.20
50274	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.14
50275	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	DECOMMISSION	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.40
50275	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	DECOMMISSION	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	4.27
50290			MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.74
50292			MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.57
50333	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	0.47
50336			MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.47
50342	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.27
50374	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.31
50380	2 - HIGH CLEARANCE VEHICLES	SEASONAL	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	0.41
50381	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.27
50386	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.37
50411	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	2.37
50429	2 - HIGH CLEARANCE VEHICLES	OPEN	DROP	DROP	DROP	DROP	0.02
50525	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	6.37
50525	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.03
50525	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.37
50526	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	DECOMMISSION	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.18
50527	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	DECOMMISSION	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.11
50535	2 - HIGH CLEARANCE VEHICLES	CLOSED	NON-MOTO SYSTEM TRAIL	NON-MOTO SYSTEM TRAIL	NON-MOTO SYSTEM TRAIL	NON-MOTO SYSTEM TRAIL	0.70
50535A	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.11
50535B	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.03
50539	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	3.39
50540	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.96
50556	2 - HIGH CLEARANCE VEHICLES	CLOSED	DECOM COMPLETE	DECOM COMPLETE	DECOM COMPLETE	DECOM COMPLETE	1.35
50556	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	DECOMMISSION	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.21
50556	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	DECOMMISSION	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.48

Road Number	Operational Maintenance Level	Existing	Alternative B	Alternative C	Alternative D	Alternative E	Miles
50556	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.36
50557	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.05
50557	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	3.16
50561	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.43
50563	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.57
50576	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.36
50577	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	DECOMMISSION	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.21
50578	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	DECOMMISSION	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.71
50578	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.00
50579	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.92
50580	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	LONG TERM CLOSURE	LONG TERM CLOSURE	2.69
50586	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.41
50586	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	0.86
50615	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	3.54
50616	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.52
50648	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	1.12
50649	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	2.13
50653	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	3.91
50657	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	1.20
50662	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	2.21
50662	2 - HIGH CLEARANCE VEHICLES	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	1.08
50662	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	DECOMMISSION	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.17
50662	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	DECOMMISSION	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.35
50668	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.34
50669	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.46
50767	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.47
50778	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	DECOMMISSION	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.22
50778R	2 - HIGH CLEARANCE VEHICLES	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	0.63
50784	2 - HIGH CLEARANCE VEHICLES	CLOSED	DECOM COMPLETE	DECOM COMPLETE	DECOM COMPLETE	DECOM COMPLETE	0.12
50786	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	1.37

Road Number	Operational Maintenance Level	Existing	Alternative B	Alternative C	Alternative D	Alternative E	Miles
50787	2 - HIGH CLEARANCE VEHICLES	CLOSED	DECOM COMPLETE	DECOM COMPLETE	DECOM COMPLETE	DECOM COMPLETE	0.07
50789	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOM COMPLETE	DECOM COMPLETE	DECOM COMPLETE	DECOM COMPLETE	1.47
50789	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.38
50790	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	DECOMMISSION	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	1.67
50791	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	DECOMMISSION	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.71
50792	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.41
50792	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	1.05
50793	2 - HIGH CLEARANCE VEHICLES	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	1.11
50794	2 - HIGH CLEARANCE VEHICLES	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	1.81
50795	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	DECOMMISSION	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.16
50808	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	1.32
50808R	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.31
50825	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.15
50825	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.83
50834	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.59
50834	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.13
50929	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.55
50930	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.48
50931	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	1.64
50932	2 - HIGH CLEARANCE VEHICLES	SEASONAL	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	0.88
50933	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.52
50934	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.99
50935	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.41
50943	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.15
50943	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.88
50944	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	4.05
50945	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.67
50946	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.25
50947	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.64
50948	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.65

Road Number	Operational Maintenance Level	Existing	Alternative B	Alternative C	Alternative D	Alternative E	Miles
50949	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.42
50950	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	4.38
50950	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.05
50950	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.84
50951	2 - HIGH CLEARANCE VEHICLES	CLOSED	IMPROVE AND OPEN	LONG TERM CLOSURE	IMPROVE AND OPEN	IMPROVE AND OPEN	1.51
50951	2 - HIGH CLEARANCE VEHICLES	SEASONAL	IMPROVE AND OPEN	LONG TERM CLOSURE	IMPROVE AND OPEN	IMPROVE AND OPEN	0.07
50953	2 - HIGH CLEARANCE VEHICLES	SEASONAL	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	1.40
50954	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	1.48
50954	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.17
50954	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.20
50955	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.70
50956	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.51
50974	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.01
50974	2 - HIGH CLEARANCE VEHICLES	SEASONAL	TRAIL CONVERSION	TRAIL CONVERSION	TRAIL CONVERSION	TRAIL CONVERSION	1.40
50975	2 - HIGH CLEARANCE VEHICLES	SEASONAL	TRAIL CONVERSION	TRAIL CONVERSION	TRAIL CONVERSION	TRAIL CONVERSION	0.89
50976	2 - HIGH CLEARANCE VEHICLES	SEASONAL	TRAIL CONVERSION	TRAIL CONVERSION	TRAIL CONVERSION	TRAIL CONVERSION	2.21
50977	2 - HIGH CLEARANCE VEHICLES	SEASONAL	TRAIL CONVERSION	MAINTAIN OR IMPROVE	TRAIL CONVERSION	TRAIL CONVERSION	1.62
50977	2 - HIGH CLEARANCE VEHICLES	SEASONAL	TRAIL CONVERSION	TRAIL CONVERSION	TRAIL CONVERSION	TRAIL CONVERSION	0.53
50978	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	0.62
50979	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	1.36
50979	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	TRAIL CONVERSION	TRAIL CONVERSION	TRAIL CONVERSION	TRAIL CONVERSION	0.27
50980	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	TRAIL CONVERSION	TRAIL CONVERSION	TRAIL CONVERSION	TRAIL CONVERSION	0.96
50981	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.79
50982	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.52
50987	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.69
50988	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.63
50989	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.81
50990	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.27
50990	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.28
50991	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.94

Road Number	Operational Maintenance Level	Existing	Alternative B	Alternative C	Alternative D	Alternative E	Miles
50992	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.50
50993	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	1.43
50994	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.53
51041	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.08
51051	2 - HIGH CLEARANCE VEHICLES		MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.05
51051	2 - HIGH CLEARANCE VEHICLES	CLOSED	DROP	DROP	DROP	DROP	0.05
51056	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	TRAIL CONVERSION	TRAIL CONVERSION	TRAIL CONVERSION	TRAIL CONVERSION	3.92
51057	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	3.70
51079	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.38
51080	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.46
51081	2 - HIGH CLEARANCE VEHICLES	SEASONAL	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	0.72
51081	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.15
51082	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.59
51083	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	0.64
51083	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.24
51083	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.41
51083	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.00
51084	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	2.70
51087	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.20
51093	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.50
51094	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.43
51121	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.22
51121	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.02
51122	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	DECOMMISSION	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.51
51123	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	0.52
51124	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	3.69
51125	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.11
51126	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.28
51127	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	1.17
51128	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.96

Road Number	Operational Maintenance Level	Existing	Alternative B	Alternative C	Alternative D	Alternative E	Miles
51129	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.32
51130	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.83
51131	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.36
51132	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.69
51156	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.52
51159	2 - HIGH CLEARANCE VEHICLES	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	0.37
51160	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.97
51163	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	1.26
51175	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.14
51175	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	3.31
51176	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.75
51177	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.79
51178	2 - HIGH CLEARANCE VEHICLES	CLOSED	IMPROVE AND OPEN	LONG TERM CLOSURE	IMPROVE AND OPEN	IMPROVE AND OPEN	1.33
51179	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.05
51180	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	0.52
51181	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.82
51182	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.27
51183	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	DECOMMISSION	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	1.22
51184	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.18
51210	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	3.41
51212	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	1.22
51213	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.52
51214	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	DECOMMISSION	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.40
51215	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	0.79
51216	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	2.65
51227	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	1.28
51228	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.67
51229	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	1.19
51231	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	0.49
51232	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.57

Road Number	Operational Maintenance Level	Existing	Alternative B	Alternative C	Alternative D	Alternative E	Miles
51233	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.57
51234	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.81
51235	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.62
51243	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	0.76
51246	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	1.86
51247	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	IMPROVE AND OPEN	DECOMMISSION	IMPROVE AND OPEN	IMPROVE AND OPEN	0.65
51248	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	1.60
51248	2 - HIGH CLEARANCE VEHICLES	SEASONAL	DECOMMISSION	LONG TERM CLOSURE	DECOMMISSION	DECOMMISSION	0.92
51248	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.80
51249	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.31
51250	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	1.94
51250	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	4.00
51251	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.87
51251	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	1.27
51251	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.73
51252	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	1.96
51253	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	4.63
51254	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.26
51255	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.83
51256	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	2.12
51257	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	1.58
51295	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.38
51313	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.70
51317	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.74
51317	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.90
51318	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.02
51319	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.87
51320	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.07
51322	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	1.67
51323	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.92

Road Number	Operational Maintenance Level	Existing	Alternative B	Alternative C	Alternative D	Alternative E	Miles
51365	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	1.04
51366	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	1.21
51367	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	1.19
51368	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.64
51368	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	2.95
51369	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.53
51369	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	1.41
51370	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.67
51418	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.61
51420	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.67
51421	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.92
51422	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	DECOMMISSION	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.45
51423	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	1.26
51435	2 - HIGH CLEARANCE VEHICLES	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	0.33
51435	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.80
51435	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.01
51436	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.46
51437	2 - HIGH CLEARANCE VEHICLES	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	0.52
51438	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.14
51439	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.70
51440	2 - HIGH CLEARANCE VEHICLES	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	1.44
51440	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.32
51441	2 - HIGH CLEARANCE VEHICLES	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	0.71
51441	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.46
51442	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	DECOMMISSION	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.76
51442	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.30
51443	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.80
51444	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.16
51445	2 - HIGH CLEARANCE VEHICLES	SEASONAL	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	0.95
51446	2 - HIGH CLEARANCE VEHICLES	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	1.48

Road Number	Operational Maintenance Level	Existing	Alternative B	Alternative C	Alternative D	Alternative E	Miles
51447	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	1.04
51448	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.30
51454	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.66
51469	2 - HIGH CLEARANCE VEHICLES	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	0.38
51471	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.82
51472	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.41
51473	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.15
51474	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.91
51475	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.90
51476	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.37
51477	2 - HIGH CLEARANCE VEHICLES	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	0.40
51478	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.20
51479	2 - HIGH CLEARANCE VEHICLES	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	1.64
51479	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	DECOMMISSION	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	1.70
51479	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.21
51479	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.00
51480	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	2.68
51481	2 - HIGH CLEARANCE VEHICLES	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	0.52
51482	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	DECOMMISSION	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.50
51483	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.68
51483	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	1.65
51483	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.01
51484	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.53
51485	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	1.02
51485	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	0.74
51486	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.31
51491	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	0.46
51492	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.53
51536	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.24
51590	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.17

Road Number	Operational Maintenance Level	Existing	Alternative B	Alternative C	Alternative D	Alternative E	Miles
51591	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.76
51592	2 - HIGH CLEARANCE VEHICLES	SEASONAL	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	0.22
51593	2 - HIGH CLEARANCE VEHICLES	SEASONAL	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	0.45
51594	2 - HIGH CLEARANCE VEHICLES	SEASONAL	DECOMMISSION	DECOMMISSION	DECOMMISSION	LONG TERM CLOSURE	0.22
51632	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.95
51659	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DROP	DROP	DROP	DROP	0.04
51660	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.45
51661	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	LONG TERM CLOSURE	0.09
51732	2 - HIGH CLEARANCE VEHICLES	SEASONAL	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	1.16
51733	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	DECOMMISSION	DECOMMISSION	DECOMMISSION	DECOMMISSION	0.32
51826	1 - BASIC CUSTODIAL CARE (CLOSED)	CLOSED	LONG TERM CLOSURE	DECOMMISSION	LONG TERM CLOSURE	LONG TERM CLOSURE	0.47
51927	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.08
58013	2 - HIGH CLEARANCE VEHICLES	OPEN	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	MAINTAIN OR IMPROVE	0.01
58017	2 - HIGH CLEARANCE VEHICLES	CLOSED	NEW LONG TERM CLOSURE	LONG TERM CLOSURE	NEW LONG TERM CLOSURE	NEW LONG TERM CLOSURE	0.09

Project Area Gravel Pits

All action alternatives would include re-opening the following the gravel pits described below. These pits are located within the Lost Creek-Boulder Creek project area.

- 4th of July/Rock Creek Pit - located on the divide between 4th of July Creek and Rock Creek in the SW ¼ of the NE ¼ of Section 12, T. 18 N., R. 2 W. The pit lies on the large flat open area on the west of Road #50136 and is approximately ½ acres in size. The pit is on basalt geology and has been used as a source for pit run. The pit would need to be expanded up to two acres for proposed use. The pit would serve as a source of rock for the road system in the 4th of July Creek area.
- Rough Creek Pit - located on Road # 50580 to the west of Rough Creek in the Lower Lost Creek drainage. The pit is on lower basalt geology. The legal location is the SW 1/4 of the NW ¼ of Section 8, T. 18 N., R. 1 W. The pit is about two acres in size and has been used as a crushed rock source. It may be suitable for pit run but should be checked on the ground. The pit serves as a rock source for lower Lost Creek and Lower West Fork Weiser River. The pit would require expansion up to 2 acres for removal of additional rock.
- West Fork Weiser/Grouse Cr. Pit - located in the NE ¼ of the SW ¼ of Section 30, T. 19 N., R. 1 W. The pit is about 1 acre in size and is located off of Road #50123 near the mouth of Grouse Creek. The pit is a potential source for large riprap, and may be suitable for crushing. The pit is about an acre in size and would require a short access road of about 500 feet or less, and expansion up to 2 acres depending on use.
- Lost Town Pit - located on Road #51124 in the NE ¼ of the SE ¼ of Section 35, T. 20 N., R. 2 W. The pit is about 0.5 acres in size and is in diced basalt rock. The pit has been used for pit-run surfacing. The pit would serve as a gravel source for Upper Lost Creek and Town Creek road systems. The pit will require further development and expansion of up to three acres depending on how much gravel is needed.
- Grouse Fawn Pit - located on Road #50123 at the saddle between Grouse Creek and Fawn Creek. Grouse Fawn Pit is located in the NE ¼ of the NE ¼ of Section 10, T. 19 N., R. 2 W., on basalt rock. Depending on the quantities of gravel need the pit would require expansion up to two acres.
- Grouse Creek Pit - located on Road #50123 in the SW ¼ of the NW ¼ of Section 11, T. 19 N., R. 2 W., on basalt rock. The approximate 1 ½ acre pit is located between two intermittent streams and future expansion will limited to about ½ acre. The pit would make suitable pit run.
- Sheep Creek Pit - located on Road # 50946 in the Sheep Creek drainage about 3 miles northwest of Lost Valley Reservoir. The legal description is the SE ¼ of the NE ¼ of Section 18, T. 19 N., R. 1 W. The pit is about 3 acres in size. The pit is in basalt and has been used for producing crushed aggregate. The pit serves as a gravel source for roads in the Lost Valley Reservoir area. It will require expansion of about two acres depending on the amount of gravel required.
- Switchback Pit - located on the divide between Mud Creek drainage and the East Branch on Road #51927. The legal description is the SE ¼ of the NW ¼ of Section 13, T. 19 N., R. 1 W. The pit has been used for crushed aggregate. It is about 2 acres in size and will need to be expanded up to two more acres depending on the quantity of gravel needed. The pit serves as a gravel source for roads in the East Branch and Mud Creek areas.

- West Branch Pit - located on the divide between the West Branch and the East Fork of Lost Creek on just to the north of Road #50102. The pit is on basalt geology and is located in the SW ¼ of the SE ¼ of Section 21, T. 20 N., R. 1 W. The pit is about 2 ½ acres in size and has been used to produce crushed aggregate. There is about 400 ft. of non-system road that access the pit from Road #50934 near it's junction with Road #50102. The pit serves as a gravel source for roads in the upper Lost Creek and the West Branch areas. The pit would require expansion of up to two acres depending on the amount of gravel required.
- Yantis Ditch Pit - located in the center of the NE ¼ of Section 10, T 20 N., R. 1 W. The pit is about 3 acres in size and has an approximate 500 ft. long non system access road coming off of Road # 50074 at Yantis Ditch on the divide between the East Branch and Boulder Creek. The road to the pit should be added to the Forest's road system and managed as an open road. The pit is used for reoccurring road maintenance activities. The pit is on basalt geology and has been used for producing crushed aggregate. The pit would need to be expanded an additional two acres depending on the amount of gravel needed. The pit currently is the primary aggregate source for activities in Boulder Creek.

Table D-2. Special Use Permits within the Project Area.

Name	Location
Forgy Hydropower/water diversion	T22N, R1E section 32
Yantis Water Diversion	T20N, R1W section 10
Natural Resource Conservation Service Snotel Site, West Branch	T20N, R1W section 15
Lost Valley Reservoir	T19N, R1W section 27
Idaho Department of Lands, Slaughter Gulch Rd. 50153	T19N, R1W section 27
Idaho Department of Lands, Lost Valley Reservoir Loop Rd. 50089	T19N, R1W sections 21, 22, 26, 27, 35
Idaho Department of Lands, State Rd. 7087	T19N, R1W section 21
Idaho Department of Lands, Slaughter Spur Rd. 58017	T19N, R1W section 27
Scism Spring Development and Pipeline	T18N, R1W section 29

Appendix E – Monitoring and Modeling Forms

Best Management Practices Effectiveness and Implementation Monitoring

Program: Soil and Water Resources

Activity, Practice or Effect: Project monitoring, timber management. Implementation monitoring of timber Best Management Practices (BMPs) and Soil and Water Conservation Practices (SWCPs).

Project Name /Location: Lost Creek-Boulder Creek Landscape Restoration Project area.

Objective: Determine if site-specific BMPs and SWCPs identified in the Record of Decision are being implemented. Provide qualitative assessment of effectiveness of BMPs and SWCPs.

Parameters: Various, depending on activity being monitored.

Methodology: The parameters will be observed occularly. The project hydrologist will review the Record of Decision, mitigation measures and management requirements in the office, develop a BMP checklist, and review the implementation of BMPs on the ground.

Frequency/Duration: When on-site, at least once a year, for the duration of sale-related activities.

Data Storage: All data will be summarized in a monitoring report by the hydrologist at the New Meadows or Council District Office.

Analysis: Field forms and photographs will be used to document the following questions:

1. Which of the Soil and Water BMPs were implemented?
2. Which of the Soil and Water BMPs appear to be effective at this time?
3. Which of the Soil and Water BMPs need to be improved?

Report: All data will be reported yearly on the monitoring summary results table for the Payette National Forest. Written reports will be retained on the District.

Cost: $300/year

Personnel: Hydrologist/Hydrologic Technician

Responsible Individual: New Meadows District Hydrologist

Responsible Official: New Meadows District Ranger

Prepared By: Leigh Bailey **Date:** 9/9/2013

Road Decommissioning Effectiveness /Implementation

Program: Soil and Water Resources

Activity, Practice, or Effect: Effectiveness monitoring

Project Name: Lost Creek-Boulder Creek Landscape Restoration Project

Location: Lost Creek-Boulder Creek Landscape Restoration Project area, New Meadows Ranger District

Objectives: Determine if treatments were effective in allowing for adequate self-maintaining drainage and allowing permitted access. Evaluate vegetative recovery and erosion potential.

Parameters: photo record

Methodology: Sites to be visited by Watershed Specialist and/or District Hydrologist

Frequency/Duration: Sites to be visited once per year for a minimum of one year.

Data Storage: Photos/field notes are stored in digital form in the East Zone District files. Summary monitoring reports are stored in electronic format on the intranet server.

Reports: All data will be reported in the monitoring summary results table for the Payette Forest. Written reports and field notes will be retained on file at an ezone District Office.

Costs: Costs listed are for field season 2012.

District Hydrologist	GS11	1/2 day	$162
Watershed Specialist	GS9	1/2 day	$107

Personnel/Skills Needed: Hydrologist/watershed restoration specialist.

Responsible Individual: District Hydrologist

Responsible Official: New Meadows District Ranger

Prepared by: Leigh Bailey Date: 9/9/2013

Thinning and Prescribed Burning In Riparian Conservation Areas

Program: Soil and Water Resources

Activity, Practice, or Effect: Thinning and Prescribed Burning in Riparian Conservation Areas (RCAs)

Project Name: Lost Creek-Boulder Creek Landscape Restoration Project

Location: Lost Creek-Boulder Creek Landscape Restoration Project RCA units

Objectives: Determine if design features were effective in maintaining coarse woody debris recruitment, shading, soil productivity, water quality and groundcover.

Parameters: photo record

Methodology: Sites to be visited by District Hydrologist and additionally the Fuels specialist and Fisheries Biologist.

Frequency/Duration: Three to seven pre-treatment photopoints to be established. Sites to be visited once after treatment and then once per year for a minimum of one year.

Data Storage: Photos/field notes are stored in digital form in the ezone District files. Summary monitoring reports are stored in electronic format on the intranet server.

Reports: All data will be reported in the monitoring summary results table for the Payette Forest. Written reports and field notes will be retained on file at an East Zone District Office.

Costs:

District Hydrologist	GS11	1/2 day	$162
Fisheries Biologist	GS9	1/2 day	$107
Fuels Specialist	GS9	1/2 day	$107

Personnel/Skills Needed: Hydrologist/watershed restoration specialist.

Responsible Individual: District Hydrologist

Responsible Official: New Meadows District Ranger

Prepared by: Leigh Bailey **Date:** 9/9/2013

Detrimental Disturbance

Program: Soil and Water Resources

Monitoring Item: Detrimental Disturbance (DD) - Project Monitoring, Timber Management, Implementation and Effectiveness of Forest Plan Standards and Guidelines.

Project Name: Lost Creek-Boulder Creek Landscape Restoration Project

Location: Lost Creek-Boulder Creek Landscape Restoration Project area, New Meadows Ranger District.

Priority: High.

Objectives: Before logging operations commence to get an existing condition for any units not already surveyed. Post-logging for units at or above 15% to determine whether the units have DD at levels that require mitigation.

Parameters: Percent DD in activity area.

Methodology: Visual survey of units and calculation of percent DD in activity area.

Frequency/Duration: Once to determine existing condition, additionally if needed to determined post-harvest condition.

Data Storage: The results and the annual monitoring results summary will be documented and stored in the 2500 files on the District. All supporting information (i.e. transects, photographs, etc.) will be stored with the documentation.

Analysis/Report: Field notes from transects and observations as well as photographs will be used to determine the amount of DD. The report will document the results of the analysis and include transect data and photographs as well as recommendations for mitigation.

Personnel: Field: one hydro tech for 3 days.

Projected Cost: $600.

Responsible Individual: Hydrologist or Hydro Technician

Responsible Official: New Meadows District Ranger.

Preparer: Leigh Bailey, Hydrologist.

Date: 9/9/2013

Coarse Woody Debris

Program: Soil and Water Resources

Monitoring Item: Coarse Woody Debris - Project Monitoring, Timber Management, Implementation and Effectiveness of Forest Plan Standards and Guidelines.

Project Name: Lost Creek-Boulder Creek Landscape Restoration Project

Location: Lost Creek-Boulder Creek Landscape Restoration Project area

Priority: High.

Objectives: To determine whether the specified amount, size, and distribution of coarse woody debris for the purpose of maintaining long-term soil productivity remains within cutting units following completion of all harvest-related activities.

Parameters: Amount of coarse (greater than 3 inch diameter) woody debris: tons/acre. Size of coarse woody debris: 3 to 15 inch and greater than 15 inch classes. Distribution (visual/photograph and by transect) of coarse woody debris.

Methodology: Brown's transect methodology for amount, size, and distribution; and visual and photograph to support distribution.

Frequency/Duration: One time per unit on a sample (10 percent of units) of various site preparation/brush disposal treatments.

Data Storage: The results and the annual monitoring results summary will be documented and stored in the 2500 files on the District. All supporting information (i.e. transects, photographs, etc.) will be stored with the documentation.

Analysis/Report: Field notes from transects and observations as well as photographs will be used to determine: 1)whether coarse woody debris guidelines and project prescriptions have been met, 2) whether those guidelines are effective in contributing to the long-term maintenance of soil productivity by supplying wood throughout the unit. The report will document the results of the analysis and include transect data and photographs as well as recommendations for changes in monitoring procedures and management prescriptions, if applicable. The report will be summarized and documented in the annual monitoring results package prepared by watershed personnel.

Personnel: Field: two GS-5's (Watershed or Fuels) for two days each, and one GS-11 Hydrologist for one-half day. The field portion can be done in conjunction with fuels (fuel transects) and/or wildlife personnel (snag monitoring) to increase efficiency. Office: one GS-11 Hydrologist for one day, analysis and write-up.

Projected Cost: $600.

Responsible Individual: Hydrologist or Hydro Technician.

Responsible Official: New Meadows District Ranger.

Preparer: Leigh Bailey, Hydrologist.

Date: 9/9/2013

Implementation Monitoring

Program: Fisheries and Watershed

Monitoring Item: Implementation Monitoring (RCA vegetation treatments)

Project Name: Lost Creek-Boulder Creek Landscape Restoration Project

Location: New Meadows Ranger District: Upper Weiser River, Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River subwatersheds.

Objectives: A subset of RCAs will be visited prior to implementation of project activities. Intermittent streams will be surveyed to determine fish presence (if needed) prior to implementation.

Methodology: Field verify that buffers are appropriate widths and RCA treatments (thinning and prescribed fire) follow the required mitigations and project design features. Fish surveys (either electrofishing surveys or visual surveys) will be conducted on intermittent streams to determine fish presence if no previous surveys have been conducted. RCA widths will be adjusted if necessary prior to implementation.

Frequency/Duration: Implementation monitoring will be conducted prior to and/or coincide with activities within RCAs.

Data Storage: Data will be stored at the New Meadows District Office and at the Payette National Forest Supervisors Office.

Analysis/Report: Summaries of field observations (including photographs) will be prepared and stored on file at the New Meadows District Office and Payette National Forest Supervisors Office. Fish distribution data (electrofishing or other fish surveys) will be stored in the Fisheries Inventory Database and the Payette National Forest Supervisor's Office.

Personnel: Fisheries Biologist/District Hydrologist or qualified designee.

Responsible Official: New Meadows District Ranger.

Preparer: Jason Greenway, New Meadows Fisheries Biologist

Date: 7/15/2013

Effectiveness Monitoring

Program: Fisheries and Watershed

Monitoring Item: Effectiveness monitoring will coincide with activities within and continue for three years

Project Name: Lost Creek-Boulder Creek Landscape Restoration Project

Location: New Meadows Ranger District: Upper Weiser River, Lost Creek, Upper West Fork Weiser River, and Lower West Fork Weiser River Subwatersheds.

Objectives: To determine the effects of RCA treatments (including thinning and prescribed fire) on Watershed Condition Indicators and effectiveness of Project Design Features and Mitigation Measures designed to maintain RCAs and RCA processes.

Methodology: Field verify RCA treatments (thinning and prescribed fire) followed the required mitigations and project design features and document effects to RCAs from project activities. Photos and field notes will be compiled to document monitoring results.

Frequency/Duration: Effectiveness monitoring will occur during activities and annually for three years.

Data Storage: Data will be stored at the New Meadows District Office and at the Payette National Forest Supervisors Office.

Analysis/Report: Summaries of field observations (including photographs) will be prepared and stored on file at New Meadows Ranger District and Payette National Forest Supervisors Office.

Personnel: Fisheries Biologist/District Hydrologist or qualified designee.

Responsible Official: New Meadows District Ranger

Preparer: Jason Greenway, New Meadows Fisheries Biologist

Date: 7/15/2013

Culvert Monitoring

Program: Fisheries

Project Name: Lost Creek-Boulder Creek Landscape Restoration Project

Location: New Meadows Ranger District: Boulder Creek, Upper Weiser River, Lost Creek, Upper West Fork Weiser River, Lower West Fork Weiser River subwatersheds.

Objectives: Document culvert replacements and evaluate fish passage at those sites. In Boulder Creek, monitoring will also fulfill the requirements of the *Stream Crossing Replacement/Removal Programmatic Section 7 Post-Project Checklist.*

Methodology: Culverts will be photographed. Fish passage, the crossing structure and stream channel characteristics will be evaluated.

Frequency/Duration: Culverts will be monitored immediately upon completion, then annually for three years.

Data Storage: Data will be stored at the New Meadows District Office and at the Payette National Forest Supervisors Office.

Analysis/Report: Data and Section 7 Post-project checklists will be stored at the New Meadows District Office and the Payette National Forest Supervisors Office.

Personnel: Fisheries Biologist

Responsible Official: New Meadows District Ranger

Preparer: Jason Greenway, New Meadows Fisheries Biologist

Date: 7/15/2013

Temperature Monitoring

Program: Fisheries

Project Name: Lost Creek-Boulder Creek Landscape Restoration Project

Location: New Meadows Ranger District: Boulder Creek, Upper Weiser River, Lost Creek, Upper West Fork Weiser River, Lower West Fork Weiser River subwatersheds.

Objectives: Monitor stream temperatures in the project area

Methodology: Temperature monitoring sites located in the project area will continue to be monitored by annually placing thermographs. Current sites may be adjusted or additional sites may be added to better monitor any effects of the project on stream temperatures. Methodologies may be adjusted as needed.

Frequency/Duration: 10 Years (annually from 2014 through 2024).

Data Storage: Data will be stored at the New Meadows District Office and at the Payette National Forest Supervisors Office.

Analysis/Report: Temperature monitoring output summaries will be developed through the NRM AqS Temperature analysis tool and stored at the Payette National Forest Supervisors Office.

Personnel: Fisheries Biologist/Forest Fisheries Field Crew

Responsible Official: New Meadows District Ranger

Prepared By: Jason Greenway, New Meadows Fisheries Biologist

Date: 07/15/2013

Threatened, Endangered and Sensitive Wildlife Species

Program: Wildlife

Monitoring Item: Threatened, Endangered, and Sensitive species (TES) surveys including snag retention

Project name: Lost Creek-Boulder Creek Landscape Restoration Project

Location: Lost Creek-Boulder Creek Landscape Restoration Project area

Priority: High

Objectives: Inventory TES with emphasis on Family 2 species (Great gray owl, northern goshawk, flammulated owl, et al.)

Parameters: Presence/Absence

Methodology: Field observation, coordination with IDFG and private landowners

Frequency/Duration: During and after project implementation as

Data Storage: Project Files

Analysis/Report: Written report

Personnel: Wildlife Biologist

Projected Costs: $3000.00 including vehicle

Responsible Individual: District Wildlife Biologist

Responsible Official: New Meadows District Ranger

Preparer: Russ Richards, Wildlife Biologist

Date: 9/9/2013

Road Decommissioning

Program: Wildlife

Monitoring Item: Road building and decommissioning

Project name: Lost Creek-Boulder Creek Landscape Restoration Project

Location: Project area

Priority: High

Objectives: Compliance with road closures elk security

Parameters: Presence/Absence

Methodology: Field observation, coordination with IDFG and private landowners

Frequency/Duration: During and after project implementation as necessary

Data Storage: Project Files

Analysis/Report: Written report

Personnel: Wildlife Biologist

Projected Costs: $2000.00 including vehicle

Responsible Individual: District Wildlife Biologist

Responsible Official: New Meadows District Ranger

Preparer: Russ Richards, Wildlife Biologist

Date: 9/9/2013

Effectiveness Monitoring

Program: Fire and Fuels

Monitoring Item: Effectiveness monitoring will coincide with activities within and continue for the Duration of Implementation

Project Name: Lost Creek-Boulder Creek Landscape Restoration Project

Location: New Meadows Ranger District: Thinning and Burning Units of the Lost Creek-Boulder Creek Project

Objectives: To determine the effects of restoration treatments (including thinning and prescribed fire) on fire regimes (vegetative conditions, fuel conditions, and ecological processes).

Methodology: Measure the tree species composition and structure, snags, and coarse wood, fuel profiles using a combination of fixed radius plots, variable radius plots, and transects. Common Stand Exam (CSE) standards would be used. Photo series guides would be used to determine changes in fuel loadings and aid in determining coarse wood.

Photo points would be established. Photos and field notes would be compiled to document monitoring results.

Frequency/Duration: Effectiveness monitoring will occur before, during, and post treatment. Post treatment may include immediately post treatment, but may also include one year and/or five years post treatment.

Data Storage: Data would be stored at the New Meadows District Office and at the Payette National Forest Supervisors Office.

Analysis/Report: Summaries of field observations (including photographs) would be prepared and stored on file at New Meadows Ranger District and Payette National Forest Supervisors Office.

Personnel: Zone Fire and/or Zone Fuels Specialists or qualified designee.

Responsible Official: New Meadows District Ranger

Preparer: Dustin Doane, Central Zone Fire Management Specialist, PAF

Date: August 23, 2013

Computer Modeling Forms

NEXUS Version 2.0 (NEXUS)

Modeling Program: NEXUS (Scott and Reinhardt 2001). Assessing crown fire potential by linking models of surface and crown fire behavior. Res. Pap. RMRS-RP-29. Fort Collins, CO: U. S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 59 p.

Purpose of the Model: Use NEXUS to compare crown fire potential for different stands, and to compare the effects of alternative fuel treatments on crown fire potential. NEXUS includes several visual tools useful in understanding how surface and crown fire models interact.

Methodology: NEXUS 2.0 is crown fire hazard analysis software that links separate models of surface and crown fire behavior to compute indices of relative crown fire potential.

Assumptions: NEXUS assumes the Rothermel crown model estimates the spread rate of fully-active crown fires. The correlation simulates the flame front spread rate alone, without the effect of spotting. However, the observed spread rates used in the correlation include the effect of short- and medium- spotting on overall fire spread rate. Also, the average spread rate from Rothermel is used, instead of the maximum.

Limitations: Due to a lack of high-quality validation data, NEXUS methods have not been validated. Users should apply results cautiously.

Data Storage: Inputs/outputs for modeling runs are found in the project record.

Output: Relevant model outputs include type of fire, rates of spread, flame lengths, and crown fire indices.

Preparer: Dustin Doane, Central Zone Fire Management Specialist, PAF

Date: August 23, 2013

BOISED Model Description

Modeling Program: BOISED is an operational sediment yield model used by the Boise and Payette National Forests to evaluate alternative land management scenarios. BOISED is a local adaptation of the R1/R4 sediment yield model developed by the Northern and Intermountain Regions of the U. S. Forest Service for application to forested watershed associated with the Idaho Batholith (Reinig et al. 1991). The model predicts changes in erosion over time and adjustments are made to fit the model to geologic parent materials other than granitics.

Purpose of the Model: BOISED can provide an estimation of on-site erosion and produces quantified estimates of average annual sediment yields for the undisturbed condition, past activities, and activities proposed in the future. The model can be used to predict natural sediment rates and sediment yield increases that may result from road construction, timber harvest, and forest fires. BOISED models dominant erosion processes, including surface and mass erosion, for each landtype in a watershed to provide estimates of natural sediment yields for undisturbed watersheds and sediment yields resulting from management activities.

Methodology: The user develops a data input file that contains acres for each landtype, harvest units, large fires, and miles of roads within each subwatershed of a project area. Harvest units, large fires, and road miles are stratified by landtype. Additionally, harvest units are stratified by harvest and yarding methods, and include harvest year. Fire data are also grouped by burn intensity and fire date. Lastly, road miles are separated by construction activity (new construction, light reconstruction, heavy reconstruction, reclaimed), level of use (open, closed, etc.), and include road gradient and construction year. Generally, data is obtained from Geographic Information System (GIS) coverages based on field observations.

Assumptions: The Boise National Forest Modified WRENS (Water Resources Evaluation of Non-point Silvicultural Sources) Procedure was applied to all landtypes on the Boise National Forest to generate a list of natural sediment yields and geologic erosion factors for the BOISED sediment yield model. Arnold (1991) completed estimates for natural sedimentation rates and geologic erosion factors for landtypes that exist on parent geologies other than the granitics of the Idaho Batholith, such as many of those on the Payette National Forest.

Basic erosion rates for road construction and road management were estimated based on the relative amount of soil disturbance compared to new construction.

Sediment from logging, fire, and roads is delivered to the stream system the same year erosion occurs. Not all sediment is necessarily delivered to streams, nor is it necessarily delivered in the same year as erosion occurs.

Boulder Creek Analysis Area - BOISED Model Assumptions

Timing

Past and proposed activities were modeled in BOISED as occurring:

Year	Activity
2015	Road Construction/Reconstruction; 1/4 of Timber Harvest
2016	1/4 of Timber Harvest
2017	1/4 of Timber Harvest

Year	Activity
2018	1/4 of Timber Harvest
2016-2025	Prescription Burning
2019	Road Decommissioning – Proposed

Unknown years of construction for existing roads were assumed to be 1960, as this date would not affect model results for period of interest.

Road use was based on road data compiled for the Forest-wide Travel Plan, with most roads receiving the light use designation, and the main travel routes receiving heavy use.

Road gradients were generally assigned based on USGS 24k topography.

All roads were rounded to the nearest 10th of a mile.

Mitigation

The values used for the mitigation were provided by the USFS. These values were based on sediment reduction data from the publication: "RI-R4" and "BOISED" Sediment Prediction Model Tests Using Forest Roads in Granitics (Ketcheson, Megahan, and King, Journal A WRA, Vol. 35, No.1 Feb. 1999, pages 83-89) and were used in previous modeling efforts in the PNF.

Mitigation 1: The standard mitigation that shows seed and fertilizer at the time of construction.

Mitigation 2: Used for graveled roads. This includes seed and fertilizer at the time of construction.

Mitigation 3: Used for closed roads. This was used only on roads closed prior to the Gaylord North project.

Mitigation 4: Used for all new construction. This reflects all current erosion control techniques that are used.

Mitigation 5 and 6: Used for light and heavy reconstruction, respectively.

Mitigation 7: Used for closed roads as part of the activities planned for the Lost Creek-Boulder Creek project. The roads are shown as light reconstruction, but the sediment delivery rate is reduced to 5% of the open road rates. Closed roads normally show 0%.

All roads received the "seed and fertilize" mitigation, as it is standard in Forest road construction practices. All new roads were shown as receiving the gravel and windrow mitigations. Because there was no year specified by the engineers to indicate the year that gravel was installed on roads, the mitigation was shown as coinciding with the year of construction.

All reconstruction (both light and heavy) and obliteration received mitigation factors that result in lower sediment delivery rates. These mitigations were added to more accurately reflect the activities that actually occur on the ground during these operations.

MITIGATION BREAKDOWN

New Road Construction: Incorporates gravel within RCAs and on sensitive landtypes within 200 feet of non-fishbearing streams, filtered windrows where feasible, seed and fertilizer, mulch and slash.

Road Segment	% of Total Area	Activity	Total Reduction %
Cut Slope	15	Mulch/slash	0.15 * 80 = 12
Contributing Area	40	Netting/filter	0.40 * 80 = 32
Fill Slope	25	Filter/windrow	0.25 * 80 = 20
Tread	20	Gravel	0.20 * 80 = 16
Totals	100	Weighted Average	80%
		Erosion Mitigation Factor	0.2

Light Road Reconstruction: Incorporates seed and fertilizer, erosion control netting and gravel within RCAs and within 200 feet of on-fishbearing streams, road re-alignment (inslope to outslope where feasible).

Road Segment	% of Total Area	Activity	Total Reduction %
Cut Slope	15	Mulch/slash	0.15 * 20 = 3
Contributing Area	40	Netting/filter	0.40 * 30 = 12
Fill Slope	25	Filter/windrow	0.25 * 20 = 5
Tread	20	Gravel	0.20 * 85 = 17
Totals	100	Weighted Average	37%
		Erosion Mitigation Factor	0.63

Heavy Road Reconstruction: Incorporates seed and fertilizer, erosion control netting and gravel within RCAs and within 200 feet of on-fishbearing streams, road re-alignment (inslope to outslope where feasible).

Road Segment	% of Total Area	Activity	Total Reduction%
Cut Slope	15	Mulch/slash	0.15 * 20 = 3
Contributing Area	40	Netting/filter	0.40 * 60 = 24
Fill Slope	25	Filter/windrow	0.25 * 20 = 5
Tread	20	Gravel	0.20 * 85 = 17
Totals	100	Weighted Average	49%
		Erosion Mitigation Factor	0.51

Road Decommissioning: Incorporates ripping the road tread, partial to full recontour, slash, mulch, silt fence at perennial stream crossings, seed and fertilizer.

Road Segment	% of Total Area	Activity	Total Reduction %
Cut Slope	15	Mulch/slash	0.15 * 80 = 12

Road Segment	% of Total Area	Activity	Total Reduction %
Contributing Area	40	Netting/filter	0.40 * 80 = 32
Fill Slope	25	Filter/windrow	0.25 * 80 = 20
Tread	20	Gravel	0.20 * 80 = 16
Totals	100	Weighted Average	80%
		Erosion Mitigation Factor	0.2

Note: For all mitigation practices, an additional 5% reduction is assumed for year 2, and years 3 through 10 receive an additional 10% reduction. These increased reductions result from increasing slope stability and vegetation recruitment.

HARVEST UNITS

Prescription	Option Chosen for BOISED
Shelterwood with reserve	Select Cut
Commercial thin/Free thin	Select Cut
Free thin/Mature plantation	Select Cut
Non-Commercial thin	Select Cut

Only the harvest activities within the last 10 years were entered in BOISED. The sediment delivery rate for any harvest activity older than 6 years declines to 0% over natural. Harvest units were rounded to the nearest 10th of an acre.

WILDFIRES

The 2012 Wesley Fire was mapped in the project area using BARC data.

OTHER

Predicted sediment is routed to single point for the analysis area as the area modeled is a complete watershed.

LIMITATIONS: The BOISED program is intended to be used within small forested watersheds approximately 1 to 50 square miles (mi^2) or 640 to 32,000 acres in size. The Boulder Creek watershed is approximately 39 mi^2 (25,000 acres).

The BOISED model simplifies for analysis an extremely complex physical system and was developed from empirical data supplemented by extrapolation based on professional judgment and our current understanding of erosion and sediment transport processes on forested lands (Potyondy et al. 1991).

It is inappropriate to use the model as a highly reliable predictor of absolute quantities of sediment delivered to streams at specific times. Model outputs are expressed as average annual natural yield and average annual management-induced yield for each year included in the analysis. Because the output is expressed as annual average conditions, actual sediment yields for individual years may exceed modeled values by an order of magnitude or more (Reinig et al. 1991), especially if significant rain on snow events were to occur. It is only appropriate to use model results for comparison of alternative management scenarios.

The routing coefficient is a very broad based value derived for the average of many stream systems and may not accurately reflect sediment transport characteristics of the particular stream system in question (Reinig et al. 1991).

DATA STORAGE: Data files are stored electronically on the hydrologist's computer hard drive and in hard copy with each project record. BOISED output can be reproduced at any time, provided the data input file and the BOISED software is available, so it is not necessary to retain copies electronically or in hard copy format.

OUTPUT: Output data from the BOISED model that was used for this project include:

Natural Sediment Yield: A table listing each landtype within the watershed and the respective acres, square miles, natural sediment yield, total landtype natural sediment yield, average landtype slope, surface and mass sediment delivery ratios, and the geologic erosion factor assigned to each landtype.

Average Natural Sediment Yield: the total natural sediment rate divided by the square miles within the watershed (tons/square mile/year).

Timber Harvest Sediment Yield: estimated sediment production from logging for each of the first three decades following the specified current year.

Fire Sediment Yield: estimated sediment production from fire for each of the first three decades following the specified current year.

Roading Sediment Yield: estimated sediment production from road construction activities for each of the first three decades following the specified current year.

Sediment Yield Summary Table: This is the most useful output for most users. It summarizes sediment yield from all sources for 10 years prior to implementation of the current project and 10 years post-implementation in one table. Total average annual sediment yield for each activity (i.e., logging, fire, roading) in tons per year is listed. Annual Percent Increase Over Natural Sediment – this displays the projected sediment yield for any single year.

PREPARERS: Leigh Bailey, New Meadows R.D., Hydrologist

Adam McMahon, New Meadows R.D., Hydrologic Technician

DATE: 9/09/2013

Appendix F - Legal and Regulatory Requirements

This DEIS adheres to the following legal and regulatory requirements and coordination:

Archaeological Resources Protection Act of 1979 (ARPA)

The purpose of ARPA is to protect irreplaceable archaeological resources on federal and Indian lands. Cultural resource surveys have been completed for the project area and several cultural resource sites have been identified (Section 1.13.1, *Cultural Resources*). The project is designed to avoid impacts to all cultural resources and requires that one sensitive cultural resource site be avoided during project activities (Section 2.10 *Project Design Features/Mitigation Measures*).

Clean Air Act, as amended in 1990

The purposes of this Act are "…to protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population; to initiate and accelerate a national research and development program to achieve the prevention and control of air pollution; to provide technical and financial assistance to State and local governments in connection with the development and execution of their air pollution prevention and control programs; and to encourage and assist the development and operation of regional air pollution prevention and control programs." This is addressed in Section 1.13.6, *Air Quality*. More information is available in the Fire and Fuels project record.

Clean Water Act, as amended in 1977 and 1982

The primary objective of this Act is to restore and maintain the integrity of the nation's waters. This objective translates into two fundamental national goals: (1) eliminate the discharge of pollutants into the nation's waters; and (2) achieve water quality levels that are fishable and swimmable. This Act establishes a non-degradation policy for all federally proposed projects. This would be accomplished through implementation of Best Management Practices (BMPs) and project design features.

Water Quality and the Clean Water Act are addressed in Table 2-5 (*Project Design Features/Mitigation Measures*) and Monitoring (Appendix E).

Civil Rights, Consumers, Minorities, and Women

All Forest Service actions have potential to produce some form of impacts, positive or negative, on the civil rights of individuals or groups, including minorities and women. The need to conduct an analysis of these potential impacts is required by Forest Service Manual and Forest Service Handbook direction. This project would not affect civil rights, consumers, minorities or women.

Endangered Species Act of 1973, as amended

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 species and threatened species, and to take such steps as may be appropriate to achieve the purposes 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."

Executive Order 11990

This order provides direction to federal agencies to protect the nation's wetlands when undertaking all activities. The Executive Order (E.O.) is addressed through project design features.

Executive Order 11988

This order requires that proposed activities must not increase flood hazards and must preserve the resource benefit of floodplains (the ability to dissipate flood flows and moderate flood peaks). This is addressed through project design features.

Executive Order 12898 – Environmental Justice

This order directs each federal agency to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. The President also signed a memorandum emphasizing the need to consider these types of effects during NEPA analysis. On March 24, 1995, the Department of Agriculture completed an implementation strategy for the executive order. Where Forest Service proposals have the potential to adversely affect minority or low-income populations disproportionately, effects must be considered and disclosed (and mitigated to the degree possible) through NEPA analysis and documentation.

Executive Order 13007

This order requires that Federal agencies accommodate American Indian and Hawaiian access and ceremonial use of sacred sites, and must avoid adversely affecting the physical integrity of these sites.

Executive Order 13112

This order requires Federal agencies whose actions may affect the status of invasive species to identify such actions, prevent the introduction of invasive species, detect and respond rapidly to and control populations of such species, provide for restoration of native species and habitat conditions; and promote public education on invasive species. Additionally, Federal agencies are directed to not carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species.

Activities proposed under the Lost-Creek Boulder Creek Project are not anticipated to substantially cause or promote the introduction or spread of invasive species.

Executive Order 13186

Executive Order 13186 requires Federal Agencies to evaluate the effects of federal actions and agency plans on migratory birds, with emphasis on species of concern. There are no interagency determinations to be made for migratory birds as with federally listed species. This information is reviewed with the U.S. Fish and Wildlife Service but there is no mechanism in place for that agency to consult on project effects.

Federal Noxious Weed Act of 1974

This Act provides for the control and management of non-indigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health. Noxious weed treatment would be conducted according to federal and state law if implemented in conjunction with this project.

Idaho Forest Practices Act

The purpose of the Idaho Forest Practices Act is to insure the continuous growth and harvest of forest trees, and to maintain forest soil, air, water, vegetation, wildlife, and aquatic habitat. The Act requires consistency with forest practice rules for federal, state, and private lands, in order to protect, maintain, and enhance the state's natural resources. Best Management Practices and contract provisions will be used to meet specific Idaho Forest Practices Act regulations. Site-specific mitigation measures are listed in Section 2.10, *Project Design Features/Mitigation Measures*.

Migratory Bird Treaty Act of 1918

The purposes of this act are to establish an international framework for the protection and conservation of migratory birds (all wild species of ducks, geese, brants, coots, gallinules, rails, snipes, woodcocks, crows, and mourning and white-winged doves). The act makes it illegal, unless permitted by regulations to "pursue, hunt, take, capture, purchase, 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, included in this Convention…for the protection of migratory birds…or any part, nest, or egg of any such bird" (16 USC 703). The original 1918 statute implemented the 1916 Convention between the United States and Great Britain (for Canada). Later amendments implemented treaties between the United States and Mexico, Japan, and the Soviet Union (now Russia).

National Environmental Policy Act of 1969, as amended

The purposes of this act are "To declare a national policy which will encourage productive and enjoyable harmony between man and his environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality" (42 U.S.C. Sec. 4321). The law further states "...it is the continuing policy of the Federal Government, in cooperation with State and local governments, and other concerned public and private organizations, to use 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" [42 U.S.C. Sec. 4331(a)]. The National Environmental Policy Act establishes the format and content requirements of environmental analysis and documentation.

National Forest Management Act of 1976

This act guides development and revision of National Forest Land Management Plans and has several sections ranging from required reporting the Secretary must submit annually to Congress to preparation requirements for timber sale contracts.

Required project-level National Forest Management Act consistency findings are described in Forest Service Manual 1900, Chapter 1920, Section 1921.12-Vegetation Management Requirements from the National Forest Management Act, and in the Forest Service Handbook 1909.12, Chapter 20, Section 29-Application of Plan to Project. Forest Service Handbook 1909.12, Chapter 60, Section 61 describes Vegetation Management Requirements at the Project Level.

All proposed vegetative treatments are found within Management Prescription Category 5.1: restoration and maintenance emphasis within forested landscapes. All proposed treatments are designed to meet Forest Plan Standards and Guidelines and MA goals and standards applicable to timber.

A. FMS 1921.12-Vegetation Management Requirements from National Forest Management Act

1921.12a Timber Management Requirements

The minimum specific management requirements for projects or activities that must be met in carrying out projects and activities for the National Forest System (NFS) are set forth in this section. Under 16 U.S.C. 1604(g) (3) (E), a Responsible Official may authorize site-specific projects and activities to harvest timber on NFS lands only where:

1. Soil, slope, or other watershed conditions will not be irreversible damaged. See Sections 3.3 *Watershed Resources* and 3.4 *Soils* in this document.
2. There is assurance that the lands can be adequately restocked within five years after final regeneration harvests (FSM 1921.12g). FSM 1921.12g-Plan Components for Restocking states; "Responsible Officials may authorize harvesting of timber only when there is reasonable assurance the harvested lands can be adequately restocked within 5 years after final regeneration harvest". See Section 3.1 *Forested Vegetation* in this document
3. Streams, streambanks, shorelines, lakes, wetlands, and other bodies of water are protected from detrimental changes in water temperatures, blockages, or water courses, and deposits of sediment where harvests are likely to seriously and adversely affect water conditions. See Sections 3.3 *Watershed Resources* and 3.4 *Soils* in this document.
4. The harvesting system to be used is not selected primarily because it will give the greatest dollar return or the greatest unit output of timber. The harvesting systems utilized in the Lost Creek-Boulder Creek Project would be proposed based on the site specific ground needs given soil, water, and other issues are not selected primarily to give the greatest dollar return or the greatest output of timber.

A Responsible Official may authorize projects and activities on NFS lands using cutting methods such as clear cutting, seed tree cutting, shelterwood cutting, and other cuts designed to regenerate an even-aged stand of timber only where:

1. For clear cutting, it is the optimum method; or where seed tree, shelterwood and other cuts are determined to be appropriate to meeting the objectives and requirements of the relevant plan (16 U.S.C. 1604 (g)(3)(F)(i)). See Section 3.1 *Forested Vegetation* in this document.
2. The interdisciplinary review has been completed and the potential environmental, biological, aesthetic, engineering, and economic impacts have been assessed on each advertised sale area and the cutting methods are consistent with the multiple use of the general area (16 U.S.C. 1604 (g)(3)(F)(ii)). Refer to other resource sections in this DEIS for specific resource assessments. Proposed treatments are consistent with Payette National Forest, Forest Plan 2003.
3. Cut blocks, patches, or strips are shaped and blended to the extent practicable with the natural terrain (16 U.S.C. 1604 (g) (3) (F) (iii)). Design of proposed treatment areas was done with consideration of visual impacts.
4. Cuts are carried out according to the maximum size limit requirements for areas to be cut during one harvest operation (FSM 1921.12e).
5. Timber cuts are carried out in a manner consistent with the protection of soil, watershed, fish, wildlife, recreation, esthetic resources, cultural and historic resources, and the regeneration of timber resources. Refer to the resource sections in Chapter 3 of this DEIS.
6. Stands of trees are harvested according to requirements for culmination of mean annual increment growth (16 U.S.C. 1604 (m); FSM 1921.12f; FSH 1909.12, ch. 60).

National Historic Preservation Act of 1966, as Amended

This act requires federal agencies to consult with the State Historic Preservation Office (SHPO) and American Indian Tribes when non-renewable cultural resources, such as archaeological sites and historic structures, may be affected by a federal action. Section 106 of this act requires federal agencies to review the effects proposed projects may have on cultural resources in the project area.

The Idaho SHPO will be consulted concerning proposed activities in the project area.

Cultural resource surveys have been completed for the project area. All cultural resources would be avoided during project implementation. Additional information can be found under issues not analyzed in detail, Section 1.13.1, *Cultural Resources*.

Idaho Stream Alteration Act

All action alternatives would adhere to the requirements of the Idaho Stream Alterations Act and the 404 Permit process of the US Corps of Engineers (Watershed Specialist Report).

Inventoried Roadless Areas and Idaho Roadless Rule

In October 2008, the USDA adopted a state-specific, final rule establishing management direction for designating roadless areas in Idaho (36 CFR 294; 73 Federal Register 61456-61496). The final rule designates 250 Idaho Roadless Areas and establishes five management themes that provide prohibitions with exceptions or conditioned permissions governing road construction, timber cutting, and discretionary mineral development. This project does not propose any activities within an Inventoried Roadless Area (IRA) or Idaho Roadless Area. However, activities are proposed immediately adjacent to the Rapid River IRA and its boundary. No impacts to the Rapid River IRA are anticipated with implementation of any of the action alternatives (section 3.1 of this DEIS). This project is consistent with the Idaho Roadless Rule.

Wild and Scenic Rivers Act

There are no river corridors designated as Wild and Scenic Rivers within the project area.

Executive Order 13443, Facilitation of Hunting Heritage and Wildlife Conservation

The proposed alternatives are consistent with the August 16, 2007 Executive Order 13443, which directs appropriate federal agencies to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat. Section 3.6 of this DEIS discloses the impacts of the proposed alternatives on big-game wildlife species.

Prime Farmland, Rangeland, and Forest Land (USDA Regulation 9500-3)

All alternatives are consistent with the Secretary of Agriculture's Memorandum for prime farmland, rangeland, and forest land, The project area does not contain prime farmland or rangeland. "Prime" forest land is a term used only for non-federal land, which would not be affected by proposed activities. Regardless of the alternative selected for implementation, NFS lands would be managed with sensitivity to adjacent private and public lands.

Omnibus Public Land Management Act of 2009

Congress, under Title IV of the Omnibus Public Land Management Act of 2009, established the Collaborative Forest Landscape Restoration (CFLR) Program. The purpose of the CFLR Program is to encourage the collaborative, science-based ecosystem restoration of priority forest landscapes. The CFLR Program provides a means to achieve an all lands approach to forest restoration" and to also:

Encourage ecological, economic, and social sustainability;

Leverage local resources with national and private resources;

Facilitate the reduction of wildfire management costs, including through reestablishing natural fire regimes and reducing the risk of uncharacteristic wildfire;

Demonstrate the degree to which various ecological restoration techniques achieve ecological and watershed health objectives; and,

Encourage utilization of forest restoration by-products to offset treatment costs, to benefit local rural economies, to and improve forest health.

Title IV also establishes the CFLR Fund, providing authority for funding of CFLR Projects selected by the Secretary of the US Department of Agriculture (USDA). In 2010 and 2011 the Forest submitted a CFLR Project, and on February 2, 2012, the Secretary of the USDA announced the selection of the Forest's Weiser-Little Salmon Headwaters CFLR Project, encompassing 800,000 acres of NFS lands in the Council and New Meadows Ranger Districts in Adams County. The Lost Creek-Boulder Creek Landscape Restoration Project is part of the landscape within the Weiser-Little Salmon Headwaters CFLR Project.

Uses and Limitations of the CFLR Fund include:

The CFLR Fund may only be used on NFS lands.

The CFLR Fund may not be used to cover planning costs.

The CFLR Fund may be used to pay for up to 50 percent of the cost of carrying out and monitoring ecological restoration treatments on NFS lands.

No more than $4,000,000 may be spent from the CFLR Fund in any one fiscal year on any one project.

The CFLR Fund for any one proposal may be expended for no more than 10 fiscal years.

Appendix G - References

Chap 1 and 2

Barrett, S. W. 2000. Fire history and fire regimes—South Fork Salmon River Drainage—Central Idaho—Payette and Boise National Forests. Unpublished report on file at U.S. Forest Service, Payette National Forest, Krassel Ranger District, McCall, ID.

Belt, G.H.; O'Laughlin, J.; Merrill, T. 1992. Design of forest riparian buffer strips for the protection of water quality: Analysis of Scientific Literature. Report No. 8, Idaho Forest, Wildlife, and Range Policy Analysis Group. PAF Fisheries Program Library Reference EM.01.0005.McDade et al. 1990

Burroughs Jr., E.R. and J.G. King. 1989. Reduction of soil erosion on forest roads. USDA Forest Service General Technical Report INT-264. Intermountain Forest and Range Experiment Station. Ogden, UT.

Chamberlin, T.W., R. D. Harr, F. H. Everest. 1991. Timber harvesting, silviculture, and watershed processes. In: Influences of forest and rangeland management on Salmonid fishes and their habitats. American Fisheries Society Special Publication 19: 181–2005.

Cross, J. 2002. Measuring the impact of harvest intensity on riparian forest functionality in terms of shade production and large woody debris recruitment potential: two models. MS thesis. Seattle, WA: University of Washington, College of Forest Resources. 76p.

Danny C. Lee, Wendel J. Hann, Terrell D. Rich, Mary M. Rowland, Wally J. Murphy, and Michelle R. Eames, 2000, Source Habitats for Terrestrial Vertebrates of Focus in the Interior Columbia Basin: Broad-Scale Trends and Management Implications, Volumes 1, 2, and 3, USDA Forest Service, Pacific Northwest Research Station, and USDI Bureau of Land Management, General Technical Report PNW-GTR-485, www.icbemp.gov

Diaz, H. F., and J. K. Eischeid 2007, Disappearing "alpine tundra" Köppen climatic type in the western United States. Geophysical Research Letters: 34, L18707, doi: 10.1029/2007GL031253. NOAA Earth System Research Laboratory, Boulder, CO.

Foltz, R.B. 2007. Wood strands, wood shreds, and straw on obliterated roads. Interim Report. USDA Forest Service, Rocky Mountain Research Station, Moscow Forestry Sciences Laboratory, Moscow, ID.

Froehlich, H.A., R.W. Robbins, D.W.R. Miles, and J.K. Lyons. 1983. Monitoring recovery of compacted skidtrails in Central Idaho. Forest Engineering Department, Oregon State University, Corvallis, OR.

Froehlich, H. A., D. E. Aulerich, and R. Curtis. 1981. Designing Skid Trail Systems to Reduce Soil Impacts from Tractive Logging Machines. Forest Research Laboratory, School of Forestry, Oregon State University, Corvalis, OR. Research Paper 44. p. 11.

Fule, P. Z., J. E. Korb, and R. Wu. 2009. Changes in forest structure of a mixed conifer forest, southwestern Colorado, USA. Forest Ecology and Management 258. P 1200-1210.

Garland, J. J. 1983. Designated Skid Trails Minimize Soil Compaction. Extension Circular 1110, The Woodland Workbook, Oregon State University Extension Service, Corvalis, OR. pp. 1, 5, 6.

Gedaloff, Z., D.L. Peterson, and N.J. Mantua. 2005. Atmospheric, climatic and ecological controls on extreme wildfire years in the northwestern United States. Ecological Applications 15: 154–74.

General Technical Report INT-264. Intermountain Forest and Range Experiment Station. Ogden, UT.

GRAIP; (http://www.fs.fed.us/GRAIP/)

Gregory, S. V., F. J. Swanson, W. A. McKee, and K. W. Cummins. 1991. An ecosystem perspective of riparian zones: focus on links between land and water. BioScience 41(8):540–551.

Haufler, J. B., C. A. Mehl, and G. J. Roloff. 1996. Using a coarse-filter approach with species assessment for ecosystem management. Wildlife Society Bulletin 24(2): 200–208.

Hillis, J.M., M.J. Thompson, J.E. Canfield, L.J. Lyon, C.L. Marcum, P.M. Dolan, and D.W. McCleery. 1991. Defining elk security: the Hillis Paradigm. In: A.G. Christensen, L.J. Lyon, and T.N. Lonner, editors. 1991. Proceedings of elk vulnerability—a symposium. Pp 38–43. April 10–12, 1991, Montana State University, Bozeman, MT.

Hunter, M.L., Jr., G.L. Jacobson, Jr., T. Webb, III. 1988. Paleoecology and the coarse-filter approach to maintaining biological diversity. Conservation Biology 2(4):375-385.

IDFG 2005. Idaho State Comprehensive Wildlife Conservation Strategy (ISCWCS)

Johnson, S.R. 1995. Factors Supporting Road Removal and/or Obliteration. USDA Forest Service. Kootenai National Forest. Libby, Montana.

King, J.G., 1989. Streamflow Responses to Road Building and Harvesting: A Comparison with the Equivalent Clearcut Area Procedure. USDA Forest Service. Intermountain Research Station, Research INT-401, April 1989.

Luce, C. H. 1997. Effectiveness of Road Ripping in Restring Infiltration Capacity of Forest Roads. Restoration Ecology 5(3): 265-270.

MacDonald, L. H.; Smart, A.E.; Wissmar, R.C. 1991. Monitoring Guidelines to Evaluate Effects of Forestry Activities on Stream in the Pacific Northwest and Alaska. United States Environmental Protection Agency. EPA/910/9-91-001. pp. 127 and 128. PAF Program Library Reference H.03.0002.

McComb and Duncan 2007

McDade. M.H.; Swanson, F.J.; McKee, W.A.; Franklin, J.F.; Van Sickle, J. 1989. Source distances for coarse woody debris entering small streams in western Oregon and Washington. Canadian Journal of Forest Research. 20.326-330. PAF Fisheries Program Library Reference F.05.0058.

Noss, R. F. 2001. Beyond Kyoto: forest management in a time of rapid climate change. Conservation Biology. 15: 578–590.

Potyondy, J. P. and Geir, T. W. Forest Service Watershed Condition Classification Technical Guide. USDA 2010. Draft.

Raphael, E.G., R.G. Holthausen, B.G. Marcot, T.D. Rich, M.M. Rowland, B.C. Wales, M.J. Wisdom. 2000. Draft. Effects of DEIS alternatives on selected terrestrial vertebrates of conservation concern within the Interior Columbia Basin Ecosystem Management Project. USDA Forest Service and USDI Bureau of Land Management, Interior Columbia Basin Ecosystem Management Plan.

Reiser, D.W.; Bjornn, T.C. 1979. Influence of forest and rangeland management on anadromous fish habitat in Western North America: habitat requirements of anadromous salmonids. Gen. Tech. Rep. PNW-GTR-096. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 1-54. PAF Fisheries Program Library Reference F.08.0016.

Rosgen, D.L. 1996. Applied River Morphology. p. 8-9. Wildland Hydrology, Pagosa Springs, CO.

Seyedbagheri, K.A. 1996. Idaho Forestry Best Management Practices: Compilation of Research on Their Effectiveness. USDA-FS, Intermountain Research Station. General Technical Report INT-GTR-339, October 1996, Boise, Idaho.

Sullivan, K.; Lisle, T.E.; Dolloff, C.A.; Grant, G.E.; Reid, L.M. 1987. Stream Channels: the link between forests and fishes. Pages 39-97 In: Streamside management: forestry and fishery interactions. E.O. Salo and T.W. Cundy (eds.) University of Washington Institute of Forest Resources. Contribution No. 57. pp. 49, 55, 57. PAF Fisheries Program Library Reference F.08.0074.

USDA Forest Service 1981. Standards and Guidelines for Soil and Related Resources. Unpublished Report. McCall, ID, pp. 7, 9.

USDA Forest Service 2003. Payette National Forest Land and Resource Management Plan. Payette National Forest, McCall Idaho.

USDA Forest Service 2011 Watershed Condition Framework. Intermountain Region. Report # FS-977, May 2011.

USDA Forest Service 2011. Wildlife Conservation Strategy. Forest Plan Amendments Proposed to Facilitate Implementation of The 2010 Plan-Scale Wildlife Conservation Strategy Phase 1: Forested Community Draft Environmental Impact Statement. USDA Forest Service, Payette National Forest.

USDA Forest Service 2012. Travel Analysis Process Report (TAP); D3 Coalition Planning Area. Payette National Forest, McCall Idaho.

Westerling, A.L., H.G. Hidalgo, D.R. Cayan, and T.W. Swetnam. 2006. Warming and earlier spring increase western U.S. forest wildfire activity. Research Article. Science 313(5789): 940–943.

Chapter 3

Forested vegetation

Barrett, S.W. 1987. Fire history of the Rapid River Drainage – New Meadows Ranger District – Payette National Forest. Systems for Environmental Management.

Barrett, S.W. 1994. Fire Regimes on the Payette National Forest – Bear Analysis Area. Final Report. Purchase Order No. 43-0256-3-0755.

Basford, D.B., J.P. Sloan, and R.A. Ryker. 1991. Developing stand density guides for predicting growth of timber species on the Salmon National Forest, Idaho. Presented at the Interior Douglas-fir the species and its management symposium. Spokane, WA.

Bean, K.M. and P. Preston. 1999. The beginning of firefighting on the Payette National Forest 1905-1960. Expanded and revised by Steve Stoddard in 2000. USDA Forest Service. Payette National Forest.

Busse, M.D., S.A. Simon, and G.M. Riegel. 2000. Tree-growth and understory responses to low-severity prescribed burning in thinned Pinus ponderosa forests of Central Oregon. Forest Science, Volume 46, Number 2.

Cochran, P.H. and J.W. Barrett. 1993. Long-term response of planted ponderosa pine to thinning in Oregon's Blue Mountains. USDA Forest Service. Western Journal of Applied Forestry.

Cochran, P.H. and J.W. Barrett. 1999a. Thirty-five year growth of ponderosa pine saplings in response to thinning and understory removal. USDA Forest Service, Pacific Northwest Research Station. Research paper PNW-RP-512.

Cochran, P.H. and J.W. Barrett. 1999b. Growth of ponderosa pine thinned to different stocking levels in central Oregon; 30-year results. USDA Forest Service, Pacific Northwest Research Station. Research paper PNW-RP-508.

Crane, M.F. 1986. Fire Ecology of the Forest Habitat Types of Central Idaho. USDA Forest Service. Intermountain Research Station. General Technical Report INT-218.

Fiedler, C.E., K.L. Metlen, and E.K. Dodson. 2010. Restoration treatment effects on stand structure, tree growth and fire hazard in a ponderosa pine/Douglas-fir forest in Montana. Forest Science. 56(1):18-31.

Franklin, J.F., M.A. Hemstrom, R. VanPelt, J.B. Buchanan, and S. Hull. 2008. The case for active management of dry forest types in eastern Washington: Perpetuating and creating old forest structures and functions. Washington State Department of Natural Resources.

Graham, R.T., A.E, Harvey, T.B. Jain, J.R. Tonn. 1999. The effects of thinning and similar stand treatments of fire behavior in western forests. Gen. Tech. Report PNW-GTR-463. Portland, OR.

Graham, R.T., S. McCaffrey, T.B. Jain. 2004. Science basis for changing forest structure to modify wildfire behavior and severity. Gen. Tech. Report RMRS-GTR-120, Fort Collins, CO.

Harrod, R.J., D.W. Peterson, N.A. Povak, and E.K. Dodson. 2009. Thinning and prescribed fire effects on overstory tree and snag structure in dry coniferous forests of the interior Pacific Northwest. Forest Ecology and Management 258 (2009) 712-721.

Hockaday, J. 1968. History – Payette National Forest. USDA Forest Service. Intermountain Region.

Johnson, M.C., D.L. Peterson, C.L. Raymond. 2007. Guide to fuel treatments in dry forests of the western United States: Assessing forest structure and fire hazard. Gen. Tech. Report. PNW-GTR-686. Portland, OR

Jorgensen, C.L., L. Lazarus, D. Scarbrough, D. Bennett, and J.C. Long. 2013. Stand Susceptibility Rating System Central Idaho Forests user's guide for the Forest Vegetation Simulator. USDA Forest Service, Region 4, Forest Pest Management, Boise Field Office.

Kliejunas, John T. 2011. A risk assessment of climate change and the impact of forest diseases on forest ecosystems in the Western United States and Canada. Gen. Tech. Rep. PSW-GTR-236. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 70 p.

Long, J. and J.D. Shaw. 2005. A density management diagram for even aged ponderosa pine stands. Western Journal of Applied Forestry. 20(4) 2005.

Long, J. and J.D. Shaw. 2012. A density management diagram for even-aged Sierra Nevada mixed-conifer stands. Western Journal of Applied Forestry. 27(4) 2012.

Mehl, C.A., R. Steele, S. Warren, B Holt, J.B. Haufler, and G.J. Roloff. 1998. The Ecosystem Diversity Matrix for the Idaho Southern Batholith Landscape: A User's Manual. Boise Cascade Corporation.

Mehl, C.A. and J. Haufler. 2004. Preserving and restoring the old-growth ponderosa pine ecosystem in Idaho. Final Report. Idaho Fish and Game. Boise, ID. WCRP Project R-1-6-0203.

Miller, S., C.Obrien, T. Demitriades, C. Lucas. Date unknown. Documentation of process for remap of PVGs for the Final EIS. Payette National Forest

Morgan, P. and R. Parsons. 2001. Historical range of variability of forests of the Idaho Southern Batholith Ecosystem – Revised Final Report.

National Resource Council. 2011. Climate Stabilization Targets: Emissions, Concentrations and Impacts over Decades to Millennia. Washington, D.C. National Academies Press. pgs 178-180.

Oliver, C.D. and Larson, B.C. 1996. Forest stand dynamics. Update edition. New York: John Wiley & Sons.

Peterson, D.L., S.S. Sackett, L.J. Robinson and S.M. Haase. 1994. The effects of repeated prescribed burning on Pinus ponderosa growth. International Journal of Wildland Fire 4(4): 239-247.

Rinehart, G. 1994. Timber management practices on Payette National Forest from 1905 to 1993.

Shaw, J.D. and J.N. Long. 2010. Consistent definition and application of Reineke's stand density index in silviculture and stand projection. USDA Forest Service Proceedings RMRS-P-61.

Steele, R., R. Pfister, R. Ryker, J. Kittams. 1981. Forest Habitat Types of Central Idaho. GTR INT-114. Intermountain Forest and Range Experiment Station. USDA Forest Service.

Tappeiner, J. C. II, D. A. Maguire and T.B. Harrington. 2007. Silviculture and ecology of western U.S. forest. Corvallis: Oregon State University Press

Teply, M. and D. McGreer. 2013. Simulating the effects of forest management on stream shade in central Idaho. Western Journal of Applied Forestry. 28(1) 2013.

Van Pelt, R. 2008. Identifying old trees and forests in eastern Washington. Washington State Department of Natural Resources. Olympia, WA. 166p.

Ogle, K. and V DuMond. 1997. Historical vegetation on national forest lands in the intermountain region. USDA Forest Service, Intermountain Region. Ogden, UT.

USDA Forest Service. 1997. An assessment of ecosystem components in the interior Columbia basin and portions of the Klamath and Great Basins. Volume II. Pacific Northwest Research Station. General Technical Report PNW-GTR-405.

USDA Forest Service. 2002. Payette National Forest 2001 Forest Inventory. Payette National Forest. Supervisor's Office. McCall, ID.

USDA Forest Service. 2003b. Southwest Idaho Ecogroup Land and Resource Management Plans. Final Environmental Impact Statement. Appendix, Volume 2. Intermountain Region.

USDA Forest Service. 2004. Payette National Forest Permanent Growth Stands. Status Report, February 2004. Supervisor's Office. Payette National Forest. McCall, ID.

USDA Forest Service. 2004. Payette National Forest Strata, December 2004. Supervisor's Office. Payette National Forest. McCall, ID.

USDA Forest Service. 2011. Forest Plan Amendments proposed to facilitate implementation of the 2011 plan-scale wildlife conservation strategy. Phase 1: forested biological community. Draft environmental impact statement. Volume 1. Intermountain region.

USDA Forest Service. 2011a. Forest Plan Amendments proposed to facilitate implementation of the 2011 plan-scale wildlife conservation strategy. Phase 1: forested biological community. Draft environmental impact statement. Volume 2. Intermountain region.

USDA Forest Health Protection. 2008. Payette National Forest 2008 Aerial Insect and Disease Detection Survey. Boise Field Office.

USDA Forest Health Protection. 2009. Payette National Forest 2009 Aerial Insect and Disease Detection Survey. Boise Field Office.

USDA Forest Health Protection. 2010. Payette National Forest 2010 Aerial Insect and Disease Detection Survey. Boise Field Office.

USDA Forest Health Protection. 2011. Payette National Forest 2011 Aerial Insect and Disease Detection Survey. Boise Field Office.

USDA Forest Health Protection. 2012. Payette National Forest 2012 Aerial Insect and Disease Detection Survey. Boise Field Office.

VanPelt, R. 2008. Identifying old trees and forests in Eastern Washington. Washington State Department of Natural Resources, Olympia, WA. 166p.

York, R.A., R.C. Heald, J.J. Battles, and J.D. York. 2004. Group selection management in conifer forests: relationships between opening size and tree growth. Canadian Journal of Forestry. 34:630-641 (2004)

Fire and Fuels

Agee, J.E., and Skinner, C.N. 2005. Basic Principles of forest fuels reduction treatments. Forest Ecology and Management 211: 83-96.

Barrett, S., Havlina, D., Jones, J., Hann, W., Frame, C., Hamilton, D., Schon, K., Demeo, T., Hutter, L., and Menakis, J. 2010. Interagency Fire Regime Condition Class Guidebook. Version 3.0 [Homepage of the Interagency Fire Regime Condition Class website, USDA Forest Service, US Department of the Interior, and The Nature Conservancy]. [Online], Available: http://www.frames.gov/partner-sites/frcc/frcc-guidebook-and-forms/. [2013, August 1]. 132p.

Barrett, S.W. 1987. Fire History of the Rapid River Drainage, New Meadows Ranger District, Payette National Forest. Systems for Environmental Management. On file: P.O. Box J, New Meadows Ranger District, Payette National Forest. 9p.

Barrett, S.W. 1994. Fire Regimes on the Payette National Forest, Bear Analysis Area, Final Report. Purchase Order 43-0256-3-0755. On file: P.O. Box J, New Meadows Ranger District, Payette National Forest. 18p.

Graham, R., Harvey, A., Jain, T. and Tonn, J. 1999. Effects of thinning and similar stand treatments on fire behavior in western forests. USDA Forest Service, Pacific Northwest Research Station, General Technical Report PNW-GTR-463.

Graham, R., McCaffrey, S. and Jain, T. 2004. Science basis for changing forest structure to modify wildfire behavior and severity. USDA Forest Service, Rocky Mountain Research Station, General Technical Report RMRS-GTR-120, 43 pp.

Hann, W.J., and Bunnell, D.L. 2001. Fire and land management planning and implementation across multiple scales. International Journal of Wildland Fire. 10: 389-403.

Hardy, C.C., Schmidt, K.M., Menakis, J.M., and Samson, N.R. 2001. Spatial data for national fire planning and fuel management. International Journal of Wildland Fire. 10: 353-372.

Harrod, R.J., Peterson, D.W., Povak, N.A., and Dodson, E.K. 2009. Thinning and prescribed fire effects on overstory tree and snag structure in dry coniferous forests of the interior Pacific Northwest. Forest Ecology and Management 258:712-721.

Keane, R.B., Ryan, K.C., Veblen, T.T., Allen, C.D., Logan, J. and Hawkes, B. 2002. Cascading Effects of Fire Exclusion in Rocky Mountain Ecosystems: A Literature Review. General Technical Report, RMRS-GTR-91. Fort Collins, CO: USDA, Forest Service, Rocky Mountain Research Station.

Reinhardt, E.D., Keane, R.E., Calkin, D.E. and Cohen, J.D. 2008 Objectives and considerations for wildland fuel treatment in forested ecosystem of the interior United States. Forest Ecology and Management 256:1997-2006.

Ritchie, M.W., Skinner, C.N., and Hamilton, T.A. 2007. Probability of tree survival after wildfire in an interior pine forest of northern California: Effects of thinning and prescribed fire. Forest Ecology and Management 247: 200-208.

Sanders, B. 1998. Hazard Risk Assessment for Ponderosa Pine Dominated Fire Regimes. Payette National Forest. On file: P.O. Box J, New Meadows Ranger District. Payette National Forest. 26p.

Schmidt, K.M., Menakis, J.P., Hardy, C.C., Hann, W.J., and Bunnell, D.L. 2002. Development of Coarse-Scale Spatial Data for Wildland Fire and Fuel Management. General Technical Report, RMRS-GTR-87. Fort Collins, CO: USDA, Forest Service, Rocky Mountain Research Station.

Scott, J.H., and Reinhardt, E.D. 2005. Stereo photo guide for estimating canopy fuel characteristics in conifer stands. Gen. Tech. Rep. RMRS-GTR-145. Fort Collins, CO:

Stephens, S.L., and Moghaddas, J.J. 2005. Experimental fuel treatment impacts on forest structure, potential fire behavior, and predicted tree mortality in a California mixed conifer forest. Forest Ecology and Management 215: 21-36.

Stephens, S.L., Moghaddas, J.L., Edminster, C., Fiedler, C.E., Haase, S., Harrington, M., Keeley, J.E., Knapp, E.E., McIver, J.D., Metlen, K., Skinner, C.N., and Youngblood, A. 2009. Fire treatment effects on vegetation structure, fuels, and potential fire severity in western U.S. forests. Ecological Applications 19(2): 305-320.

U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 49 p.

USDA, Forest Service (Forest Plan). 2003. Payette National Forest Land and Resource Management Plan. Payette National Forest. McCall, ID.

Watershed Resources

Bailey, L. 2004. Equivalent Clearcut Area (ECA) - Payette National Forest. Unpublished paper describing ECA/Peak Flow analysis on the Payette NF.

Belt, G.H., J. O'Laughlin, and T. Merrill. 1992. Design of forest riparian buffer strips for the protection of water quality: analysis of scientific literature. Rep. No. 8. Moscow, ID: University of Idaho, Idaho Forest, Wildlife and Range Policy Analysis Group. 35 p.

Boyer, D.E. and Dell, J.D . 1980. Fire Effects on Pacific Northwest forest Soils. USDA Forest Service, Pacific Northwest Region, Watershed Management and Aviation and Fire Management. Portland, OR. pp. 35-36.

Cissel, Richard M.; Black, Thomas A.; Schreuders, Kimberly A. T.; Prasad, Ajay; Luce, Charles H.;Tarboton, David G.; Nelson, Nathan A. 2012. The Geomorphic Road Analysis and Inventory

Package (GRAIP) Volume 2: Office Procedures. Gen. Tech. Rep. RMRS-GTR-281WWW. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 160 p.

Dissmeyer, G.E. 1994. Evaluating the Effectiveness of Forestry Best Management Practices in Meeting Water Quality Goals or Standards. Miscellaneous Publication 1520. USDA-FS, Southern Region, Atlanta, GA. pp. 1-179.

Dixon, M.D., Wasniewski. 1998. Summary of Landslide Inventory on the Westside of the Payette National Forest from the New Year 1997 Storm. Payette National Forest Supervisors Office, McCall, Idaho.

EPA 1980. An Approach to Water Resource Evaluation of Non-point Silvicultural Sources (A Procedural Handbook). Environmental Research Laboratory, Office of Research and Development. EPA, Athens, GA EPA-600/8-80-012. pp. Xi-X39.

EPA 2005. National Management Measures to Control Nonpoint Source Pollution from Forestry. US Environmental Protection Agency, Office of Water, Washington, DC. EPA-841-B-05-001.

Haupt, Harold F. 1967. Unpublished memorandum from Intermountain Forest and Range Experiment Station dated January 16, 1967.

Hibbert, A.R., 1967. Forest Treatment Effects on Water Yield. International Symposium on Forest Hydrology. Pennsylvania State University. pp. 527-782, Pergamon Press, Inc., New York.

IAC 2011. Water Quality Standards and Wastewater Treatment Requirements. Title 1, Chapter 2, Idaho Administrative Code (IDAPA 58.01.02), pp. 91-92. http://adm.idaho.gov/adminrules/rules/idapa58/0102.pdf

IAC-IDL 2011. Rules Pertaining to the Idaho Forest Practices Act. IDAPA 20, Title 02, Chapter 01, Idaho Administrative Code (IDAPA 20.02.01), p 6-7, 11-13.

http://adm.idaho.gov/adminrules/rules/idapa20/0201.pdf

IDEQ 2006. Final Little Salmon River TMDL Idaho Department of Environmental Quality. Boise, ID

IDEQ 2008a. Little Salmon River TMDL Implementation Plan for Agriculture, Forestry, and Urban/Suburban Activities. Idaho Department of Environmental Quality. Boise, ID

IDEQ 2008b. MOU Implementing Non-Point Water Quality Program in the State of Idaho. FS#08-11046000-015.

IDEQ 2011a. 2010 Integrated 303(d)/305(b) Report. Section 5: Impaired Waters: Rivers; pp. 42, 60, 76-77.

http://www.deq.idaho.gov/water/data_reports/surface_water/monitoring/2010_draft.cfm

IDEQ 2011b. Draft Little Salmon River Subbasin Five-Year Review. Department of Environmental Quality. Boise Regional Office, Boise, Idaho.

IDEQ 2011c. "A Preliminary Evaluation of Road De-icing Chemical Concentrations in North Idaho Streams Adjacent to Interstate 90 and Draining Fourth of July Pass". Coeur d'Alene Regional Office, Coeur d'Alene, Idaho.

Jones, J.A. and Grant, G.E. 1996. Peak flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon. Water Resources Research. Vol. 32. No. 4, pges 959-974. April 1996.

Kalabokidis, K. D. and Wakimoto, R. H. 1992. Prescribed Burning in Eneven-aged Stand Management of Ponderosa Pine/Douglas Fir Forests. Journal of Environmental Management. Vol. 34 p. 221-235

King, J.G., 1989. Streamflow Responses to Road Building and Harvesting: A Comparison With the Equivalent Clearcut Area Procedure. USDA Forest Service. Intermountain Research Station, Research INT-401, April 1989.

Megahan, W.F. and J. Hornbeck. 2000. Lessons Learned in Watershed Management: A Retrospective View. USDF Forest Service Proceedings RMRS.

Nelson, R.L.; Burns, D.C. 2007. Ambient stream temperature and development of watershed condition indicators for wild fish species, with emphasis on redband trout, on the Payette National Forest. Preliminary Working Draft. Unpublished Report. McCall, ID: USDA Forest Service, Payette National Forest. 42p. PAF Fisheries Program Library Reference EF.03.0018.

Nelson, R.L.; Zurstadt, C.F.; Bonaminio, G. 2007. PAF Fish and Fish Habitat Inventory Procedures Unpublished protocol. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette, National Forest. 6p.

Overton, K.C., J.D. McIntyre, R. Armstrong, S.L. Whitwell, and K.A. Duncan. 1995. User's guide to fish habitat descriptions that represent natural conditions in the Salmon River basin, Idaho. USDA Forest Service General Technical Report INT-GTR-322. Intermountain Research Station. Ogden, Utah.

Overton, C.K.; Wollrab, S.P.; Roberts, B.C.; Radko, M.A. 1997. R1/R4 (Northern and Intermountain Regions) fish and fish habitat standard inventory procedures handbook. Gen. Tech. Rep. INT-GR-346. Odgen UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station 142p. PAF Fisheries Program Library Reference F.10.0079.

Pack, R.T., Tarboton, D.G., and Goodwin, C.N. 1998. The SINMAP Approach to Terrain Stability Mapping.

Payette and Boise National Forests. 1991. Arnold, J. F. Natural sediment rates and geologic erosion factors for landtypes occurring on the New Meadows, Council, and McCall Ranger Districts of the Payette National Forest. Personal Services Contract Study contracted by the Payette and Boise National Forests.

Payette NF. 1994. Riparian Inventory – Lost Valley Reservoir and Lower Lost Creek Subwatersheds. Hershenow, N. McCall Ranger District, Payette National Forest. McCall, ID.

Payette NF. 1996. Riparian Inventory – Upper West Fork of the Weiser River, including Upper West Fork Weiser River, Middle West Fork Weiser River, and Grouse Creek Subwatersheds. Melbo, J. McCall Ranger District, Payette National Forest. McCall, ID.

Payette NF. 1997. Riparian Inventory – Boulder Creek Watershed. Hershenow, N. New Meadows Ranger District, Payette National Forest. McCall, ID.

Payette NF. 2000. Riparian Inventory – East Branch and West Branch, Upper Weiser River Subwatershed. Weaver, P. New Meadows Ranger District, Payette National Forest. McCall, ID.

Payette NF. 2003. Riparian Inventory – Upper Lost Creek and East Fork Lost Creek, Upper Lost Creek Subwatershed. Weaver, P. New Meadows Ranger District, Payette National Forest. McCall, ID.

Payette NF. 2004. Riparian Inventory – Lower West Fork Weiser River Subwatershed. Weaver, P. New Meadows Ranger District, Payette National Forest. McCall, ID.

Payette NF. 2011. Lost Creek Dispersed Campsite Survey. Conway, P. New Meadows Ranger District, Payette National Forest. McCall, ID.

Payette NF. 2012. Watershed Improvement Needs – Boulder Creek. Gabica, A. New Meadows Ranger District. Payette National Forest. McCall, ID.

Pfankuch, Dale, J. 1975. Stream Reach Inventory and Channel Stability Evaluation - A Watershed Management Procedure. USDA Forest Service, R1-75-002. Government Printing Office #696-260/200, Washington D.C.; 26pp.

Potyondy, J. P. and Geir, T. W. Forest Service Watershed Condition Classification Technical Guide. USDA 2010. Draft.

Quigley, Thomas M. and S. J. Arbelbide 1997. An assessment of ecosystem components in the interior Columbia Basin and portions of the Klamath and Great Basins. USDA Forest Service Pacific Research Station, Portland.

Reinig, L., Potyondy, J.P., Beveridge, R., and Hernandez, F.M., BOISED User's Guide and Program Documentation Version 3.01. Boise National Forest. 1991.

Robichaud, P.R., Waldrop, T.A., 1994, A Comparison of Surface Runoff and Sediment Yields from Low and High Severity Site Preparation Burns, Water Resources Bulletin, Volume 30, 1;27-34.

Robichaud, P. R. 1999. Fire effects on infiltration rates after prescribed fire in Northern rocky Mountain forests, USA. Journal of Hydrology 231-232 (2000) 220-229

Rosgen, D.L. 1994. A Classification of natural rivers. CATENA. Volume 22, June 1994. Elsevier Science B.V. pp 169-199.

Rosgen, D.L. 1996. Applied River Morphology. p. 8-9. Wildland Hydrology, Pagosa Springs, CO.

Sandberg, D., 1980. Duff Reduction by Prescribed Underburning in Douglas-fir. USDA Forest Service Res. Paper PNW-272, 18p. Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Seyedbagheri, K.A. 1996. Idaho Forestry Best Management Practices: Compilation of Research on Their Effectiveness. USDA-FS, Intemrountain Research Station. General Technical Report INT-GTR-339, October 1996, Boise, Idaho.

Spence, Brian C, Gregg A. Lomnicky, Robert M. Hughes, and Richard P. Noritzki 1996. An ecosystem approach to salmonid conservation. TR-Y501-96-6057, Mantech Environmental Researches Corp, Corvallis, Or.

Stednick, J.D. 1996. Monitoring the effects of timber harvest on annual water yield. Journal of Hydrology. 176: pp. 79-95.

Thompson, R.A., Skabelund, P.H., Dean, E. N., Kulesza, N.C., and Dean E.N. 1973a. Soil-Hydrologic Reconnaissance; New Meadows Ranger District, Payette National Forest.

Thompson, R.A., Skabelund, P.H., Dean, E. N., and Kulesza, N.C. 1973b. Soil-Hydrologic Reconnaissance; McCall Ranger District, Payette National Forest.

Troendle, C.A., and King, R.M. 1985. The Effect of Timber Harvest on the Fool Creek Watershed, 30 Years Later. Water Resources Research, Vol. 21, No. 12, 1915-1922.

Troendle, Charles A.; MacDonald, Lee H.; Luce, Charles H.; Larsen, I. J. 2010. Fuel management and water yield. In: Elliot, William J.; Miller, Ina Sue; Audin, Lisa, eds. Cumulative watershed effects of fuel management in the western United States. Gen. Tech. Rep. RMRS-GTR-231. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. p. 124-148.

USDA Forest Service 1974 Forest Hydrology, Part II - Hydrologic Effects of Vegetation Manipulation

USDA Forest Service. 1979 Effects of Fire on Water, State of Knowledge Review. WO-10. Washington, D.C.

USDA Forest Service. 2005. Soil and Water Conservation Practices Handbook, FSH 2509.22.

USDA Forest Service. 2000. Goose Creek Watershed Projects Final Environmental Impact Statement and Record of Decision. New Meadows Ranger District, Payette National Forest. Appendix L – Roads and Road Status. McCall, ID

USDA Forest Service. 2003. Roads Analysis of the Meadows Slope Wildland Fire Protection Project. New Meadows Ranger District, Payette National Forest. McCall, ID.

USDA Forest Service. 2005. Meadows Slope Wildland Fire Protection Project, Final Environmental Impact Statement and Record of Decision. New Meadows Ranger District, Payette National Forest. Appendix G – Road Use and Status. McCall, ID.

USDA Forest Service. 2003d. Payette National Forest Land and Resource Management Plan, Intermountain Region.

USDA Forest Service. 2003e. Southwest Idaho Ecogroup Land and Resource Management Plan Final Environmental Impact Statement. Final Environmental Impact Statement and Appendices.

USDA Forest Service. 2011. Upper Little Goose Creek Travel Analysis Plan. McCall and New Meadows ranger Districts, Payette National Forest.

USDI Fish and Wildlife Service 1979. Classification of Wetlands and Deep Water Habitats of the U.S. FWS/OBS-79/31. USDI-FWS, Washington, D.C.

Zurstadt, Caleb and Gina Bonaminio 2005. 2004 Payette National Forest Fisheries-Range Monitoring Report. Payette National Forest, McCall Idaho.

Soils

Cleland, D.T.; Avers, P.E.; McNab, W.H.; Jensen, M.E.; Bailey, R.G., King, T.; Russell, W.E. 1997. National Hierarchical Framework of Ecological Units. Published in, Boyce, M. S.; Haney, A., ed. 1997. Ecosystem Management Applications for Sustainable Forest and Wildlife Resources. Yale University Press, New Haven, CT. pp. 181-200.

Dixon, M.D., Wasniewski. 1998. Summary of Landslide Inventory on the Westside of the Payette National Forest from the New Year 1997 Storm. Payette National Forest Supervisors Office, McCall, Idaho.

Lund, Karen. Geology of the Payette National Forest and vicinity, west-central Idaho. No. 1666. United States Geological Survey, 2004.

Lott, John T. Soils Field Report - Proposed Lost Creek/Boulder Creek Landscape Restoration Project, New Meadows Ranger District. August 29, 2013.

Pack, R.T., Tarboton, D.G., and Goodwin, C.N. 1998. The SINMAP Approach to Terrain Stability Mapping.

Thompson, R.A., P.H. Skabelund, N.C. Kulesza, and E.N. Dean. 1973a. Soil-Hydrologic Reconnaissance. New Meadows Ranger District. Payette National Forest.

USDA Forest Service. 2003. Payette National Forest Land and Resource Management Plan. McCall, Idaho.

Fisheries

Adams, S. 1994. Bull trout distribution and habitat use in the Weiser River drainage, Idaho. M.S. Thesis, Univ. of Idaho, Moscow, ID. 84 p.

Alexander, G.R.; E.A. Hansen. E.A. 1986. Sand Bedload in a Brook Trout Stream. North American Journal of Fisheries Management. 6: 9-13. PAF Fisheries Program Library Reference EF.06.002.

Archer, E.K.; Scully, R.A.; Henderson, R.; Roper, B.B.; Heitke, J.D. 2012. Effectiveness monitoring for stream and riparian areas: sampling protocol for stream channel attributes. PACFISH/INFISH Biological Opinion Effectiveness Monitoring Program (PIBO-EMP) Staff Multi-federal Agency Monitoring Program: Logan UT. Unpublished Paper.

Arkle, R. S.; Pilliod, D.S.. 2010. Prescribed fires as ecological surrogates for wildfires: A stream and riparian perspective. Forest Ecology and Management 259 (2010) 893-903. PAF Fisheries Program Library Reference EM.05.0025.

Bailey, L. 2013. Soil and Water Specialist Report for the Lost Creek-Boulder Creek Landscape Restoration Project EIS. New Meadows Ranger District, New Meadows Id, ID.

Beche, L. A.; Scott L. S.; Resh, V.H.. 2005. Effects of Prescribed Fire on a Sierra Nevada (California, USA) stream and its riparian zone. Forest Ecology and Management 218 (2005) 37-59. PAF Fisheries Program Library Reference EM.05.005.

Belt, G.H.; O'Laughlin, J.; Merrill, T. 1992. Design of forest riparian buffer strips for the protection of water quality: Analysis of Scientific Literature. Report No. 8, Idaho Forest, Wildlife, and Range Policy Analysis Group. PAF Fisheries Program Library Reference EM.01.0005.

Betschta, R.L.; Bilby, R.E.; Brown, G.W.; Holtby, L.B.; Hofstra, T.D. 1987. Stream temperature and aquatic habitat: fisheries and forestry interactions. In: Salo, E.O.; Cundy, T.W., eds.

Forestry and Fisheries Interactions. Contribution Number 57. Seattle, Washington: University of Washington, Institute of Forest Resources. 191-232. PAF Fisheries Program Library Reference F.08.0073.

Bjornn, T.C.; Reiser, D.W. 1991. Habitat Requirements of Salmonids in Streams. In: Influences of Forest and Rangeland management on Salmonid Fishes and Their Habitats. W.R. Meehan (ed.). American Fisheries Society Special Publication. PAF Fisheries Program Library Reference F.08.0142.

Bjorrn, T. C.; Brusven, M.A.; Molnau, M.P.; Milligan, J.H.; Klamt, R.A.; Chacho, E.; Schaye, C. 1977. Transport of Granitic Sediment in Streams and its Effects on Insects and Fish. University of Idaho, Forest Wildlife and Range Experiment Station. PAF Fisheries Program Library Reference F.06.0028.

Bonar, S. A., M. Divens, and B. Bolding. 1997. Methods for sampling the distribution and abundance of bull trout and dolly varden. Inland fisheries investigations, resources assessment division, Washington Department of Fish and Wildlife, Olympia, WA.

Brazier J. R.; Brown, G.W. 1973. Buffer strips for stream temperature control. Research Paper 15. Forest Research Laboratory, School of Forestry, Oregon State University, Corvallis Oregon. PAF Fisheries Program Library Reference H.03.0005.

Burns, D.C.; Faurot, M.; Hogen, D.M.; McGee M.; Nelson, R.; Olson, D.; Wagoner, L.; Zurstadt, C. 2005. Bull Trout Populations on the Payette national Forest. Unpublished Report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 97p.

Cederholm, C. S.; Salo, E.O. 1979. The Effects of Logging Road Landslide Siltation on the Salmon and Trout Spawning gravels of Stequaleho Creek and the Clearwater River Basin, Jefferson County, Washington, 1971-1978.

Final Report FRI-UW-7915, part III. Seattle, WA: University of Washington, Fisheries Research Institute. 98p. PAF Fisheries Program Library Reference Number F.06.0027.

Cederholm, C.J.; Lestelle, L.C. 1974. Observations on the Effects of Landslide Siltation on Salmon and Trout Resources of the Clearwater River, Jefferson County, Washington, 197301973. Final Report: Part 1. FRI-UW-7404. Fisheries Research Institute, University of Washington, Seattle. 89 p. PAF Fisheries Program Library Reference F.06.0031.

Chamberlin, T. W., R. D. Harr, F. H. Everest. 1991. Timber Harvesting, Silviculture, and Watershed Processes. In: Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19: 181-2005. PAF Fisheries Program Library Reference BM.04.0002.

Chapman, D.W.; McLeod, K.P. 1987. Development of criteria for sediment in the northern rockies ecoregion. EPA contract 68-01-6986. Boise, Idaho. Don Chapman Consultants, INC. 279 p. PAF Fisheries Program Library Reference G29.

Colyer, W. T.; Kershner, J.L.; Hilderbrand, R.H. 2005. Movements of Bonneville Cutthroat Trout in the Thomas Fork of the Bear River, Idaho-Wyoming. North American Journal of Fisheries Management 25: 954-963.

Coble, D. W. 1961. Influence of Water Exchange and Dissolved Oxygen in Redds on Survival of Steelhead Trout Embryos. Transactions of the American Fisheries Society. 90: 469-474. PAF Fisheries Program Library Reference EF.06.0009.

Cross, J. 2002. Measuring the impact of harvest intensity on riparian forest functionality in terms of shade production and large woody debris recruitment potential: two models. MS thesis. Seattle, WA: University of Washington, College of Forest Resources. 76p.

DeWalle, D.R. 2010. Modeling Stream Shade: Riparian Buffer Height and Density as Important as Buffer Width. Journal of the American Water Resources Association. Vol. 46, No. 2.

FEMAT (Forest Ecosystem Management Assessment Team). 1993. Forest Ecosystem Management: an Ecological, Economic, and Social Assessment. Portland, OR: U.S. Department of Agriculture, Forest Service. PAF Fisheries Program Library Reference E.03.0037.

Fetherston, K. L.; Naiman, R.J.; Bilby, R.E. 1995. Large Woody Debris, Physical Process, and Riparian Forest Development in Montane River Networks of the Pacific Northwest. Geomorphology 13: 133-144.

Fleece, W.C. 2002. Modeling the Delivery of Large Wood to Streams with Light Detection and Ranging Data. USDA Forest Service Gen Tech Rep PSW-GTR-181.2002.

Furniss, M.J.; Roelofs, T.D.; Yee, C.S. 1991. Road Construction and Maintenance Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society, Special Publication. PAF Fisheries Program Library Reference EM.02.0002.

Giambra, T. 2012. Fisheries Specialist Report for the Mill Creek/Council Mountain Landscape Restoration Project EIS. Council Ranger District, Council, ID.

Gibson, R. J,; Haedrich, R.L., Wernerheim, C.M. 2005. Loss of Fish Habitat as a Consequence of Inappropriately Constructed Stream Crossings. Fisheries vol 30, no. 1.

Greenway, J. R.; Nelson, R.L. 2012. Biological Assessment for the Potential Effects of Managing the Payette National Forest in the Little Salmon River Section 7 Watershed on Snake River Spring/Summer and Fall Chinook

salmon, Snake River Steelhead, and Columbia River Bull Trout and Biological Evaluation for Westslope Cutthroat Trout Volume 24. Rocky Bear Project and Brundage Wildland-Urban Interface/ Bear Basin Restoration Project Unpublished biological assessment. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 162p. PAF Fisheries Program Library Reference EM.11.0224.

Greenway, J.R.; Nalder, C. 2013 ***IN DRAFT ***Biological Assessment for the Potential Effects of Managing the Payette National Forest in the Little Salmon River Section 7 Watershed on Snake River Spring/Summer and Fall Chinook salmon, Snake River Steelhead, and Columbia River Bull Trout and Biological Evaluation for Westslope Cutthroat Trout Volume 25. Lost Creek-Boulder Creek Landscape Restoration Project. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 162p. PAF Fisheries Program Library Reference EM.11.0224.

Griffith, J.S.;. Smith, R.W. 1993. Use of Winter Concealment Cover by Juvenile Cutthroat and Brown Trout in the South Fork of the Snake River, Idaho. North American Journal of Fisheries Management, 13:4, 823-830. PAF Fisheries Program Library Reference EF.02.0048.

Gucinski, H.; Furniss, M.J.; Ziemer, R.R.; Brookes, M.H. 2001. Forest roads: a synthesis of scientific information. Gen. Tech. Rep. PNWGTR-509. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Research Station. 103p. PAF Fisheries Program Library Reference EM.02.0034.

Halofsky, J.E.; Hibbs, D.E. 2009. Controls on Early Post-Fire Woody Plant Colonization in Riparian Areas. Forest Ecology and Management 258: 1350-1358. PAF Fisheries Program Library Reference EM.05.0028.

Harvey, B. C., J. L. White, and R. J Nakamoto. 2009. The Effect of Deposited Fine Sediment on Summer Survival and Growth of Rainbow Trout in Riffles of a Small Stream. North American Journal of Fisheries Management 29: 434-440.

Hausle, D. A.; Coble, D.W.. 1976. Influence of Sand in Redds on Survival and Emergence of Brook Trout (Salvelinus fontinalis). Transactions of the American Fisheries Society, 105:1, 57-63. PAF Fisheries Program Library Reference EF.06.0011.

Hillman, T. W.; Griffith, J.S.; Platts, W.S. 1987. Summer and Winter Habitat Selection by Juvenile Chinook Salmon in a Highly Sedimented Idaho Stream. Transactions of the American Fisheries Society, 116:2, 185-195. PAF Fisheries Program Library Reference EF.06.0013.

Hogen, D. and D. Scarnecchia. 2001. Spatial and temporal distribution of bull trout, Salvelinus confluentus, in the upper East Fork South Fork Salmon River watershed, Idaho. Challenge Cost Share Agreement No. 12-CCS-99-003. Final Completion Report, University of Idaho. Moscow, Idaho.

Isaak, D.; Reiman, B.; Horan, D. 2009. A watershed-scale monitoring protocol for bull trout. Gen. tech. Rep. RMRS_GTR-224. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 25 p.

Irving, J. S.; Bjornn, T.C. 1984. Effects of Substrate Size Composition on Survival of Kokanee Salmon and Cutthroat and Rainbow Trout Embryos. U. S. Forest Service Intermountain Forest and Range Experiment Station, Cooperative Agreement 12-11- 204-11, Supplement 87, Completion Report. Boise, ID. PAF Fisheries Program Library Reference F.06.0029.

Johnson, S. 2004. Factors Influencing Stream Temperatures in Small Streams: Substrate Effects and a Shading Experiment. Canadian Journal of Fisheries and Aquatic Science. Vol. 61.

Kelley, D. W.; Dettman, D.H.. 1980. Relationships Between Streamflow, Rearing Habitat, Substrate Conditions, and Juvenile Steelhead Populations in Lagunitas Creek, Marine County, 1979. Marine County Water District, California. Unpublished Report. PAF Fisheries Program Library Reference EF.08.0028.

Kennell, D.; Gabica, A. 2012. Watershed Improvement Needs (WIN), Boulder Creek, Payette National Forest, New Meadows District, September, 2012. Payette National Forest. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette, National Forest. 52p.

Luce, C.H.; Wemple, B.C.. 2001. Introduction to Special Issue on Hydrologic and Geomorphic Effects of Forest Roads. USDA Forest Service, Rocky Mountain Research Station. Boise, ID.

Murphy, M. L. and W. R. Meehan. 1991. Stream Ecosystems. In Influences of Forest and Rangeland Management on Salmonid fishes and Their Habitats. American Fisheries Society Special Publication. 19: 17-46, 1991.

MacDonald, L. H.; Smart, A.W.; Wissmar, R.C. 1991. Monitoring Guidelines to Evaluate Effects of Forestry Activities on Stream in the Pacific Northwest and Alaska. United States Environmental Protection Agency. EPA/910/9-91-001. pp. 127 and 128. PAF Program Library Reference H.03.0002.

McCuddin M.E. 1977. Survival of Salmon and Trout Embryos and Fry in Gravel-Sand Mixtures. A Thesis presented in Partial Fulfillment of the Requirement for the Degree of Master of Science, Major in Fisheries Resources in the University of Idaho Graduate School. p. vii.

McDade. M.H.; Swanson, F.J.; McKee, W.A.; Franklin, J.F.; Van Sickle, J. 1989. Source distances for coarse woody debris entering small streams in western Oregon and Washington. Canadian Journal of Forest Research. 20.326-330. PAF Fisheries Program Library Reference F.05.0058.

Mihursky, J.A.; Kennedy V.S. 1967 Water temperature criteria to protect aquatic life. American Fisheries Society Special Publication No. 4. P 20-32. PAF Fisheries Program Library Reference F.08.0012.

Murphy, M.L.; K. V. Koski, K.V. 1989. Input and Depletion of Woody Debris in Alaska Streams and Implications for Streamside Management. North American Journal of Fisheries Management 9:427-436.

Murphy, M. L.; Meehan, W.R. 1991. Stream Ecosystems. In Influences of Forest and Rangeland Management on Salmonid fishes and Their Habitats. American Fisheries Society Special Publication. 19: 17-46, 1991.

Naiman, R.J.; Balian, E.V.; Bartz,K.K.; Bilby,R.E.; Letterell, J.J. 2002. Deadwood Dynamics in stream ecosystems. USDA Forest Service Gen. Tech. Rep. PSW-GTR-181.

Nelson, R.L.; Burns, D.C.; Ketchu, K.L. 2004. Relationships between estimated equivalent clearcut area and fish habitat attributes in selected streams on the Payette National Forest, with application to use of watershed condition indicators in forest planning and consultation under the Endangered Species Act. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette, National Forest. 63p.

Nelson, R.L.; Zurstadt, C.F.; Bonaminio, G. 2007. PAF Fish and Fish Habitat Inventory Procedures Unpublished protocol. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette, National Forest. 6p.

Nelson, R.L.; Burns, D.C. 2007. Ambient stream temperature and development of watershed condition indicators for wild fish species, with emphasis on redband trout, on the Payette National Forest. Preliminary Working Draft. Unpublished Report. McCall, ID: USDA Forest Service, Payette National Forest. 42p. PAF Fisheries Program Library Reference EF.03.0018

Nelson, R.L. 2011. Bull Trout Designated Critical Habitat PCE – Baseline and Effects Matrix Crosswalks. Unpublished File memorandum EF.01.0041. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest, Fisheries Program. 4p.

Nelson, R.L.; James, C.J. 2010. Evaluation of Critical habitat Proposed for bull Trout (*Salvelinus Confluentus*) by the U.S. Fish and Wildlife Service, 14 January 2010 (75 FR2270), with specific Reference to Bull Trout Populations, Potential Habitat, and Viability on the Payette National Forest. Unpublished Report. McCall, ID: USDA Forest Service, Payette National Forest. 57p. PAF Fisheries Program Library Reference EF.01.0031.

Nelson, R.L.,….. 2012. Payette National Forest. Fish Distribution, Unpublished Data. McCall , ID: U.S. Department of Agriculture, Forest Service, Payette National Forest.

Nuttall, P.M. 1972. The Effects of Sand Deposition Upon the Macroinvertebrate Fauna of the River Camel, Cornwall. Freshwater Biology. Vol 2, No. 3: 181-186. PAF Fisheries Program Library Reference E.05.0009.

Olson , D. Burns D.C. 2007. Biological Assessment for the Potential Effects of Managing the Payette National Forest in the Little Salmon River Section 7 Watershed on Snake River Spring/Summer and Fall Chinook salmon, Snake River Steelhead, and Columbia River Bull Trout and Biological Evaluation for Westslope Cutthroat Trout Volume 2. Ongoing and New Actions. Unpublished biological assessment. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 354p.

Overton, C.K.; McIntyre, J.D.; Armstrong, R.; Whitwell, S.L.; Duncan, K.A. 1995. User's Guide to Fish Habitat; Descriptions that Represent Natural Conditions in the Salmon River Basin, Idaho. Gen. Tech. Rep. INT-GTR-322. Odgen UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station 148p. PAF Fisheries Program Library Reference F.08.0079.

Overton, C.K.; Wollrab, S.P.; Roberts, B.C.; Radko, M.A. 1997. R1/R4 (Northern and Intermountain Regions) fish and fish habitat standard inventory procedures handbook. Gen. Tech. Rep. INT-GR-346. Odgen UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station 142p. PAF Fisheries Program Library Reference F.10.0079.

Peterson, R. H.; Metcalfe, J.L.. 1981. Emergence of Atlantic Salmon Fry from Gravels of Varying Composition: a Laboratory Study. Can. Tech. Rep. Fish. Aquat. Sci. No. 1020. 15pp. St. Andrews, NB: Department of Fisheries and Oceans, Fisheries and Environmental Sciences, Biological Station. PAF Fisheries Program Library Reference F.02.0135.

Petrosky, C.E.; Holubetz, T.B. 1985. Habitat Evaluation for Off-Site Mitigation Record, Annual Report for FY 1984. Idaho Department of Fish and Game, Prepared for Larry Everson, Contracting Officer's Technical Representative, U.S. Department of Energy, Bonneville Power Administration. Contract No. DE-A179-84BP13381.

Petrosky, C.E.; Holubetz, T.B.; Everson, L. 1988 Habitat Evaluation for Off-Site Mitigation Record, Annual Report for FY 1987. Idaho Department of Fish and Game and Bonneville Power Administration. Contract No. DE-A179-84BP13381, Project No. 83-7.

PFMC (Pacific Fishery Management Council). 1999. Identification and description of essential fish habitat, adverse impacts, and recommended conservation measures for salmon. Appendix A to Amendment 14, Pacific Coast salmon fishery management plan.

Phillips, R. W.; Lantz, R.L; Claire, E.W.; Moring, J.R. 1975. Some Effects of Gravel Mixtures on Emergence of Coho Salmon and Steelhead Trout Fry. Transactions of the American Fisheries Society. 104:3, 461-466. PAF Fisheries Program Library Reference EF.06.0010.

USDA 2010.Potyondy, J. P.; Geir, T. W. Forest Service Watershed Condition Classification Technical Guide.

Potyondy, J.P.; Cole G.F.; Megahan W.F. 1991. A procedure for estimating sediment yields from forested watersheds. Boise National Forest. PAF Fisheries Program Library Reference EH.02.0003

Quigley, T. M.; Arbelbide, S. J., tech. eds. 1997. An assessment of ecosystem components in the interior Columbia basin and portions of the Klamath and Great Basins. Gen. Tech. Rep. PNW-GTR-405. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 4 vol.

Reinig, L.; Beveridge, R.L.; Potyondy, J.P.; Hernandez, F.M. 1991. BOISED User's Guide and Program Documentation Version 3.01. USDA Forest Service, Boise National Forest, Boise, Idaho, USA.

Reiser, D.W.; Bjornn, T.C. 1979. Influence of forest and rangeland management on anadromous fish habitat in Western North America: habitat requirements of anadromous salmonids. Gen. Tech. Rep. PNW-GTR-096. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 1-54. PAF Fisheries Program Library Reference F.08.0016.

Reiser, D.W.; R.G. White, R.G. 1988. Effects of two sediment size-classes on survival of steelhead and Chinook salmon eggs. North American Journal of Fisheries Management 8:432-437.

Rieman, B. E.; McIntyre, J.D. 1995. Occurrence of Bull Trout in Naturally Fragmented Habitat Patches of Varied Size. Transactions of the American Fisheries Society. Vol 124, no. 3.

Scaife, D.; Hoefer, S. 2011. Biological Assessment for Restoration Activities at Stream Crossings Affecting the habitat of ESA-Listed Fish Species on National Forests and Bureau of Land Management Public Lands in Idaho. USA Forest Service, USDI Bureau of Land Management, USDI Fish and Wildlife Service, National Marine Fisheries Service and US Army Corps of Engineers. 112 p. PAF Fisheries Program Library Reference EM.11.0258.

Steinblums , I. 1977. Streamside Buffer Strips: Survival, Effectiveness, and Design. Master's Thesis. Corvallis OR: Oregon State University. 181p. PAF Fisheries Program Library Reference F.02.0010.

Sullivan, K.; Lisle, T.E.; Dolloff, C.A.; Grant, G.E.; Reid, L.M. 1987. Stream Channels: the link between forests and fishes. Pages 39-97 In: Streamside management: forestry and fishery interactions. E.O. Salo and T.W. Cundy (eds.) University of Washington Institute of Forest Resources. Contribution No. 57. pp. 49, 55, 57. PAF Fisheries Program Library Reference F.08.0074.

Suttle, K.B.; Power, M.E.; Levine, J.M.; McNeely C. 2004. How fine sediment in riverbeds impairs growth and survival of juvenile salmonids. Ecological Applications 14:969-974. PAF Fisheries Program Library Reference EF.06.0005.

Tagart, J. V. 1984. Coho Salmon Survival from Egg Deposition to Fry Emergence. In Proceedings of the Olympic Wild Fish Conference. J. M. Walton and D. B. Houston, eds. Peninsula College, Fisheries Technology Program, Port Angeles, Washington. PAF Fisheries Program Library Reference F.02.0127.

Tebo, Jr., L.B. 1955. Effects of Siltation, Resulting from Improper Logging, on the Bottom Fauna of a Small Trout Stream in the Southern Appalachians. North Carolina Wildlife Resources Commission. Hoffman, NC. PAF Fisheries Program Library Reference EF.06.0014.

Thurrow, R.F. 1994. Underwater methods for study of salmonids in the Intermountain West. Gen. Tech. Rep. INT-GTR-307. Ogden, UT: U.S. Department of Agriculture., Forest Service, Intermountain Research Station. 28p.

USDA. 2013. Payette National Forest. Fish Inventory Database, Unpublished Data. McCall , ID: U.S. Department of Agriculture, Forest Service, Payette National Forest.

USDA. 2013. Payette National Forest. Lost Creek-Boulder Creek Landscape Restoration Project EIS. Payette National Forest, New Meadows Ranger District.

USDA. 2013. Natural Resource Manager (NRM). Aquatic Surveys (AqS) Temperature Reports. http://fsweb.nris.fs.fed.us/products/AqS/index.shtml

USDA. 2010. Payette National Forest. Unpublished Temperature Summary Reports.

USDA. 2003a. Payette National Forest. Land and Resource Management Plan. Volumes 1 and 2. McCall , ID: U.S. Department of Agriculture, Forest Service, Payette National Forest.

USDA. 2003b. Payette National Forest. Land and Resource Management Plan. McCall , ID: U.S. Department of Agriculture, Forest Service, Payette National Forest.

USDA. 1988. Forest Service. Region 1 and Region 4 Soil and Water Conservation Practices Handbook, FSH 2509.22.

USDA. 2013. Payette National Forest GIS database. McCall , ID: U.S. Department of Agriculture, Forest Service, Payette National Forest.

Wagoner, L. and Burns D.C. 1995. Biological Assessment for the Potential Effects of Issuing a Temporary One-year Permit for Operation of the Existing Yantis Ditch Diversion Structure In the Salmon River Watershed on Snake River Spring/Summer Chinook salmon. Unpublished Biological Assessment. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 14p.

Watry, C.B. and D.M. Hogen. 2002. A summary of results from bull trout spawning surveys conducted on the West Zone of the Payette National Forest, September 2001. Council Ranger District, Council, Idaho.

Zurstadt, C.; Burns. D.C. 2007. Biological Assessment for the Potential Effects of Managing the Payette National Forest in the Weiser River Section 7 Watershed on Columbia River Bull Trout and Biological Evaluation for Westslope Cutthroat Trout Volume 9. Ongoing and New Actions. Unpublished biological assessment. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 225p.

Zurstadt, C.; Adams, C. 2005. Road-Stream Crossing Inventory, Payette National Forest. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette, National Forest. 12p.

Wildlife

Anthony, R.G., R.L. Knight, G.T. Allen, B.R. McClelland, and J.J. Hodges. 1982. Habitat use by nesting and roosting bald eagles in the Pacific Northwest. U.S. Fish & Wildlife Publication, Paper 34, USDI Fish and Wildlife Service. Pages 332-342 in Sabol, K., editor. 1982. Transactions of the forty-seventh North American Wildlife and Natural Resources Conference, Washington, D.C.

Arthur, S.M., W.B. Krohn, and J.R. Gilbert. 1989. Habitat use and diet of fishers. Journal of Wildlife Management, 53(3).

Aubry, K.B., and D.B. Houston. 1992. Distribution and status of the fisher (Martes pennanti) in Washington. Northwestern Naturalist 73(3).

Aubry, K., and C. Raley. 2003. Coming home to roost: the pileated woodpecker as ecosystem engineer. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon, USA.

Aubry, K.B., K.S. McKelvey, and J.P. Copeland. 2007. Distribution and broadscale habitat relations of the wolverine in the contiguous United States. Journal of Wildlife Management 71(7).

Banci, V. 1994. Wolverine. Chapter 5 in Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, [and others], technical editors. The scientific basis for conserving forest carnivores: American marten, fisher, lynx and wolverine in the Western United States. General Technical Report RM-254. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado, USA.

Barnes, K.P. 2007. Ecology, habitat use, and probability of detection of flammulated owls in the Boise National Forest. M.S. Thesis, Boise State University, Boise, Idaho, USA.

Blair, S., and G. Servheen. 1995. A species conservation assessment and strategy for the white-headed woodpecker. USDA Forest Service, Northern and Intermountain regions, USDI Fish and Wildlife Service and Idaho Department of Fish and Game, Boise, Idaho, USA.

Brennan, L.A. September 1990. Report on a survey of mountain quail habitat in Eastern Oregon, southeastern Washington, Western Idaho and Northern Nevada. Department of Forestry and Resource Management, University of California, Berkeley, CA; and Department of Wildlife, Humboldt State University, Arcata, CA.

Brennan, L.A., W.M. Block, and R.J. Gutierrez. 1987. Habitat use by mountain quail in northern California. The Condor, Vol. 89(1).

Brock, B.L., R.M. Inman, K.H. Inman, A.J. McCue, M.L. Packila, and B. Giddings. 2007. Broad-scale wolverine habitat in the conterminous Rocky Mountain states. Chapter 2 in Greater Yellowstone Wolverine Study, Cumulative Report, May 2007. Wildlife Conservation Society, North America Program, General Specialist Report, Bozeman, Montana, USA.

Buehler, D. A. 2000. Bald Eagle (Haliaeetus leucocephalus). In The Birds of North America, No. 506 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Bull, E. L., and E. C. Meslow. 1977. Habitat requirements of the pileated woodpecker in northeastern Oregon. Journal of Forestry, 75.

Bull, E.L., S.R. Peterson, and J.W. Thomas. 1986. Resource partitioning among woodpeckers in northeastern Oregon. Research Note PNW-444. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon.

Bull, E.L., M.G. Henjum, and R.S. Rohweder. 1988. Nesting and foraging habitat of great gray owls. Journal of Raptor Research, 22(4).

Bull, E.L., A. Wright, and M. Henjum. 1990. Nesting habitat of flammulated owls in Oregon. Journal of Raptor Research, 24(3).

Bull, E.L., R.S. Holthausen, and M.G. Henjum.1992. Roost trees used by pileated woodpeckers in northeastern Oregon. Journal of Wildlife Management 56(4).

Bull, E.L., C.G. Parks, and T.R. Torgersen. 1997. Trees and logs important to wildlife in the Interior Columbia River Basin. General Technical Report GTR-391-97-014. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon.

Buskirk, S.W., and R.A. Powell. 1994. Habitat ecology of fishers and American martens. In Buskirk S.W., A.S. Harestad, M.G. Raphael, and R.A. Powell. 1994. Martens, sables, and fishers: biology and conservation. Cornell University Press.

Cascade Ranger District Project Survey Records. 2010. Compilation of species surveys completed for district projects. Boise National Forest, Boise, Idaho.

Cascade Ranger District Sightings Record Database. 2010. GIS layer and database containing district sighting locations and descriptions. Boise National Forest, Boise, Idaho.

Cascade Ranger District Tracking Records. 2010. Compilation of snow-tracking and camera set surveys on the Cascade Ranger District. Boise National Forest, Boise Idaho.

Cassirer, E. F., J. D. Reichel, and R. L. Wallen.1996. Harlequin duck (Histrionicus histrionicus). Unpublished report to the USDA Forest Service / USDI Bureau of Land Management habitat conservation assessment and conservation strategy for the United States Rocky Mountains. Idaho Department of Fish Game, Boise, Idaho.

Caton, E.L. 1996. Effects of fire and salvage logging on the cavity-nesting bird community in northwestern Montana. Ph.D. Dissertation, University of Montana, Missoula, Montana.

Christensen, A.G., L.J. Lyon, R. Pedersen, P. Harrington, W.L. Bodie, R. Johnson, and B. O'Gara. 1995. Ungulate assessment in the Columbia River Basin. Interior Columbia Basin Ecosystem Management Project.

Collins, K.M.1980. Aspects of the biology of the great gray owl, Strix nebulosa. M.S. Thesis, University of Manitoba, Winnipeg, Manitoba, Canada.

Connelly, J.W., S.T. Knick, M.A. Schroeder, and S.J. Stiver. 2004. Conservation assessment of greater sage-grouse and sagebrush habitats. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, Wyoming.

Copeland, J.P. 1996. Biology of the wolverine in central Idaho. M.S. Thesis, University of Idaho, Moscow, Idaho.

Copeland, J.P., K.S. McKelvey, K.B. Aubry, A. Landa, J. Persson, R.M. Inman, J. Krebs, E. Lofroth, H. Golden, J.R. Squires, A. Magoun, M.K. Schwartz, J. Wilmot,C.L. Copeland, R.E. Yates, I. Kojola, and R. May. 2010. The bioclimatic envelope of the wolverine (Gulo gulo): do climatic constraints limit its geographic distribution? Canadian Journal of Zoology 88.

Crist, C., and L.M. Nutt. 2007. Northern Idaho Ground Squirrel Habitat Model ver. 1.0. Boise National Forest, Boise, Idaho.

Dixon, R.D. 1995a. Density, nest-site and roost-site characteristics, home-range, habitat-use, and behavior of white-headed woodpeckers: Deschutes and Winema National Forests, Oregon. Nongame Report 93-3-01. Oregon Department of Fish and Wildlife, Salem, Oregon.

Dixon, R.D. 1995b. Ecology of white-headed woodpeckers in the central Oregon cascades. A Thesis presented in partial fulfillment of the requirements for the Degree of Master of Science with a Major in Wildlife Resources in the College of Graduate Studies. University of Idaho, Moscow, Idaho.

Dixon, R.D. 1998. An assessment of white-headed woodpeckers in a regional landscape. USDA Forest Service Contract #101-ecol-98. Report also serves as supplemental report to Oregon Department of Fish and Wildlife (#63506193).

Dudley, J.G., and V.A. Saab. 2007. Home range size of black-backed woodpeckers in burned forests of southwestern Idaho. Western North American Naturalist 67:4.

Duncan, J.R., and P.H. Hayward. 1994. Review of technical knowledge: great gray owls. Chapter 14 in Hayward, G.D., and J. Verner, technical editors. 1994. Flammulated, boreal, and great gray owls in the United States: a technical conservation assessment. General Technical Report RM-253. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado, USA.

Evans Mack, D. 2006. Northern Idaho ground squirrel population monitoring progress report. Idaho Department of Fish and Game, Boise, Idaho, USA.

Evans Mack, D., M. Coyle, and M. Wilson. 2012. Occurrence of the flammulated owl (Otus flammeolus) on the Payette National Forest and assessment of habitat and presence within the Mill Creek–Council Mountain Restoration Project Area, 2011. Payette National Forest Contract # x. Idaho Department of Fish and Game, McCall, Idaho, USA.

Federal Register, Vol. 72, No. 160, Pages 46537-46538. August 20, 2007. Executive Order 13443- Facilitation of Hunting Heritage and Wildlife Conservation.

Federal Register, Vol. 66, No. 11, Pages 3853-3856. January 17, 2001. Executive Order 13186- Responsibilities of Federal Agencies to Protect Migratory Birds.

Franklin, A.B. 1988. Breeding biology of the great gray owl in southeastern Idaho and northwestern Wyoming. The Condor, 90(3).

Frederick, G.P. 1991. Effects of forest roads on grizzly bears, elk, and gray wolves: a literature review. Publication R1-91-73. USDA Forest Service, Kootenai National Forest, Libby, Montana, USA.

Geier-Hayes, K., and L. Nutt. 2008. Townsend's big-eared bat documentation of modeling parameters. USDA Forest Service, Boise National Forest, Boise, Idaho.

Goggans, Rebecca. 1986. Habitat use by flammulated owls in northeastern Oregon. M.S. Thesis, Oregon State University, Corvallis, OR.

Goggans, R., R.D. Dixon, and C. Seminara.1988. Habitat use by three-toed and black-backed woodpeckers, Deschutes National Forest, Oregon. Nongame Report 87-3-02. Oregon Department of Fish and Wildlife, Portland, Oregon.

Goggans, R., R.D. Dixon, and L. C.Seminara,1989. Habitat use by three-toed and black-backed woodpeckers, Deschutes National Forest, Oregon. Oregon Department of Fish and Wildlife, Nongame Wildlife Program, USDA Deschutes National Forest, 43 p.

Gomez, Dale. 1994. Conservation assessment for the spotted frog (Rana pretiosa) in the Intermountain Region USFS. USDA, Forest Service, Intermountain Region, Ogden, Utah.

Griffith, Randy S. 1993. Accipiter gentilis. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2009, November 19].

Groves, Craig R., Bart Butterfield, Abigail Lippincott, Blair Csuti, and J. Michael Scott. 1997. Atlas of Idaho's wildlife: integrating gap analysis and Natural Heritage information. Idaho Department of Fish and Game, Nongame and Endangered Wildlife Program, Boise, Idaho.

Gutierrez, R. J., and D. J. Delehanty. 1999. Mountain quail (Oreortyx pictus). In The Birds of North America, No. 457 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Hatler, D.F. 1989. A Wolverine Management Strategy for British Columbia. Wildlife Bulletin No. B-60. British Columbia Ministry of Environment. Wildlife Branch. Victoria B.C. 124 p.

Hayward, Gregory. September 1994. Chapter 9: Review of technical knowledge- boreal owls. In Hayward, Gregory; and Jon Verner; editors. 1994. Flammulated, boreal, and great gray owls in the United States: A technical conservation assessment. General Specialist Report RM-253. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO.

Hayward, Gregory D.; and Ronald E. Escano. 1989. Goshawk nest-site characteristics in western Montana and northern Idaho. The Condor, Vol. 91, No.2, pp. 476-479.

Hayward, Gregory D. and Patricia H. Hayward. 1993. Boreal Owl (Aegolius funereus). No. 63 in A. Poole and F. Gill, Editors. The Birds of North America. The Academy of Natural Sciences, Philadelphia and The American Ornithologists' Union, Washington, D.C.

Hayward, Gregory D., Patricia H. Hayward, and Edward O. Garton. 1993. Ecology of the Boreal Owls in the Northern Rocky Mountains, USA, Wildlife Monographs, A publication of the Wildlife Society, No. 124.

Heinemeyer, Kimberly S. 1993. Temporal Dynamics in the Movements and Habitat Use of Reintroduced Fishers in NW Montana. Univ. of Montana, M.S. Thesis. Missoula, Mt. 158pp (complete document on file at the National FS Library, Fort Collins, CO).

Hoffman, Nancy J. 1997. Distribution of Picoides woodpeckers in relation to habitat disturbance within the Yellowstone Area. M.S. Thesis, Fish and Wildlife Management Program, Montana State University, Bozeman, MT.

Hutto, Richard L. 1995. Composition of bird communities following stand-replacement fires in Northern Rocky Mountain (U.S.A.) conifer forests. Conservation Biology, Vol. 9, No. 5, pp. 1041-1058.

Idaho Department of Fish and Game (IDFG). August 2009. Element occurrence record database. Idaho Department of Fish and Game Conservation Sciences Program. [Digital data acquired under a limited use agreement. Individuals or entities seeking this information are referred to Idaho Department of Fish and Game, Boise, Idaho.

Idaho Department of Fish and Game (IDFG). 1995. Habitat conservation assessment and strategy: spotted bat (Euderma maculatum). Idaho Department of Fish and Game, Boise, Idaho.

Idaho Department of Fish and Game (IDFG). 2005. Idaho comprehensive wildlife conservation strategy. Idaho Department Fish and Game, Boise, Idaho.

Idaho Department of Fish and Game (IDFG). 2009. Elk Progress Report. Study I, Job 1. July 1, 2007 to June 30, 2008. Project W-170-R-32. Cal Groen, Director. April, 2009. Boise, Idaho. 143p.

Idaho Partners in Flight (IPIF). 2000. Idaho bird conservation plan, version 1.0. Idaho Partners in Flight.

Inman, R.M., K.H. Inman, Kristine H. Inman, M.L. Packila, and Anthony J. McCue. 2007. Wolverine reproductive rates and maternal habitat in Greater Yellowstone. In: Wildlife Conservation Society Greater Yellowstone Wolverine Program Cumulative Report May 2007, pp. 65-84.

Jones, J.L. 1991. Habitat use of fisher in northcentral Idaho. M.S. Thesis, University of Idaho, Moscow, Idaho, 147 p.

Jones, Jeffrey L., and Edward O. Garton. 1994. Selection of successional stages by fishers in north-central Idaho. In Buskirk, Steven W., Alton S. Harestad, Martin G. Raphael, and Roger A. Powell. 1994. Martens, sables, and fishers: biology and conservation. Cornell University Press.

Joshi, P.K. 2009. Night roosts of bald eagles (Haliaeetus leucocephalus) wintering in northern Arizona. M.S. Thesis, Northern Arizona University, Flagstaff, Arizona.

Koehler, Gary M. 1990. Population and habitat characteristics of lynx and snowshoe hares in north central Washington. Can. J. Zool. 68: 845-851.

Koehler, Gary M., and J. David Brittell. 1990. Managing spruce-fir habitat for lynx and snowshoe hares. Journal of Forestry.

Leege, Thomas A., 1984. Evaluating and Managing Summer Elk Habitat in Northern Idaho. Idaho Department of Fish and Game. Wildlife Bulletin No. 11.

Leonard, Jr., David L. 2001. American Three-toed Woodpecker (*Picoides dorsalis*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/588 doi:10.2173/bna.588.

Lester, Amy N. 1980. Numerical response of woodpeckers and their effect on mortality of mountain pine beetles in lodgepole pine in northwestern Montana. M.S. Thesis, University of Montana, Missoula, MT.

Magoun, A., and J.P. Copeland. 1998. Characteristics of wolverine reproductive den sites. Journal of Wildlife Management 62:1313-1320.

Marcot, Bruce G. 1997. The species-environment relations (SER) modeling approach of the Interior Columbia Basin Ecosystem Project. Analysis Notes (USDA Forest Service, Washington Office/Ecosystem Management Analysis Center, Fort Collins, CO 7(2):11-15.

Marcot, Bruce G. and Madeleine Vander Heyden. 2001. Key ecological functions of wildlife species. Chapter 6. Pages 168-186.

Marcot, Bruce G., Barbara C. Wales, and Rick Demmer. 2003. Range maps of terrestrial species in the interior Columbia River basin and northern portions of the Klamath and Great Basins. Gen. Tech. Rep. PNW-GTR-583. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 304 p.

Marcot, Bruce, Michael A. Castellano, John A. Christy and others. 1997. Chapter 5: Terrestrial ecology assessment. In Quigley, Thomas M.; Sylvia J. Arbelbide; Technical editors. June 1997. An assessment of ecosystem components in the Interior Columbia Basin and portions of the Klamath and Great Basins: Volume III. USDA, Forest Service, Pacific Northwest Research Station, Portland, Oregon.

Marshall, David B. 1992. Status of the black-backed woodpecker in Oregon and Washington. Audubon Society of Portland, Portland, OR.

McCallum, D. A. 1994. Flammulated owl (Otus flammeolus). In The Birds of North America, No. 93 (A. Poole and F. Gill, Eds). Philadelphia: The Academy of Natural Sciences; Washington, D. C.: The American Ornithologists' Union.

McCallum, D. Archibald, and Frederick R. Gehlbach. 1988. Nest-site preferences of flammulated owls in western New Mexico. The Condor, Vol. 90, No.3, pp.653-661.

McComb, Brenda and Sally Duncan. 2007. Biodiversity Conservation in Contemporary Landscapes, Stressors, and Ranges of Variability: Scientific and Social Views. University of Massachusetts, Amherst, MA, and Oregon State University, Corvallis, OR

McIntyre, J.W., and J. F. Barr. 1997. Common loon (Gavia immer). In The Birds of North America, No. 313 (A. Poole and F.Gill,eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

Miller, Susan, Lisa Nutt, and Kathy Geier-Hayes. January 17, 2008. Greater sage grouse documentation of modeling parameters -- Boise National Forest. Project record for the Boise National Forest Plan. 13 p.

Miller, Susan, Kathy Geier-Hayes, and Lisa M. Nutt. January 15, 2008. Peregrine falcon documentation of modeling parameters – Boise National Forest. Project record for the Boise National Forest Plan. 8 p.

Miller, Susan, Kathy Geier-Hayes, and Lisa M. Nutt. January 18, 2008. Western bluebird documentation of modeling parameters for the Boise National Forest. USDA Forest Service, Boise National Forest, Project Record for the Boise National Forest Plan.

Miller, Susan, Kathy Geier-Hayes, and Lisa M. Nutt. January 18, 2008. Spotted bat documentation of modeling parameters for the Boise National Forest. USDA Forest Service, Boise National Forest, Project Record for the Boise National Forest Plan.

Nadeau, M.S., C. Mack, J. Holyan, J. Husseman, M. Lucid, D. Spicer, B. Thomas. 2009. Wolf conservation and management in Idaho; progress report 2008. Idaho Department of Fish and Game, 600 South Walnut, Boise, Idaho; Nez Perce Tribe, P.O. Box 365, Lapwai, Idaho. 106 pp.

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. (Black-backed Woodpecker). Available http://www.natureserve.org/explorer. (Accessed: May 23, 2008).

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. (Pileated Woodpecker). Available http://www.natureserve.org/explorer. (Accessed: May 23, 2008).

Nelson, Jack R. 1982. Chapter 10 - Relationships of elk and other large herbivores. Pages 415-441. In Thomas, Jack Ward and Dale E. Toweill, editors. 1982. Elk of North America: Ecology and Management. Wildlife Management Insitute. In cooperation with USDA, Forest Service. 698 pgs. Stackpole Books.

Nelson, Jack R., and Thomas A. Leege. 1982. Chapter 8- Nutritional requirements and food habits. In Thomas, Jack Ward; and Dale E. Toweill; editors. 1982. Elk of North America: ecology and management. A Wildlife Management Institute book, developed in cooperation with USDA, Forest Service.

Nutt, Lisa M.; and Carey Crist. February 1, 2008. Northern Idaho ground squirrel documentation of modeling parameters – Boise National Forest. Project record for the Boise National Forest Plan. 9 p.

Nutt,Lisa, Kathy Geier-Hayes, Randall Hayman. 2010. (Draft) Wildlife Conservation Strategy Report, USDA Forest Service, Boise National Forest, Boise, Idaho.

O'Neil, Thomas A., David H. Johnson, Charley Barrett, Marla Trevithick, Kelly A. Bettinger, Chris Kiilsgaard, Madeleine Vander Heyden, Eva L. Greda, Derek Stinson, Bruce G. Marcot, Patrick J. Doran, Susan Tank, and Laurie Wunder. 2001. Matrixes for Wildlife-Habitat Relationship in Oregon and Washington. Northwest Habitat Institute. In D. H. Johnson and T. A. O'Neil (Manag. Dirs.) Wildlife-Habitat Relationships in Oregon and Washington. Oregon State University Press, Corvallis, Oregon, USA.

Prescott, D. J., and E. Yensen. 1999. Habitat variable correlated with presence of southern Idaho ground squirrels, Spermophilus brunneus endemicus.

Reynolds, R. T. and B. D. Linkhart. 1987. The nesting biology of Flammulated Owls in Colorado. Pages 239–248 In Biology and conservation of northern forest owls (R. W. Nero, R. J. Clark, R. J. Knapton, and R. H. Hamre, Editors). USDA, Forest Service, General Specialist Report RM- 142, Rocky Mountain Research Station, Fort Collins, Colorado, USA.

Reynolds, R.T., and B.D. Linkhart. 1992. Flammulated owls in ponderosa pine: evidence of preference for old growth. In Old growth forest in the Southwest and Rocky Mountain regions: proceedings of a workshop. Gen. Tech. Rep. RM-213, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Reynolds, Richard T., Graham, Russell T.; Reiser, M. Hildegard; and others. 1992. Management recommendations for the northern goshawk in the southwestern United States. Gen. Tech. Rep. RM-217. Ft. Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 90p.

Ruediger, Bill, Jim Claar, Steve Gniadek, Bryon Holdt, Lyle Lewis, Steve Mighton, Bob Naney, Gary Patton, Tony Rinaldi, Joel Trick, Anne Vandehey, Fred Wahl, Nancy Warren, Dick Wenger, and Al Williamson. 2000. Canada lynx conservation assessment and strategy. USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Forest Service Publication #R1-00-53, Missoula, MT.

Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski. 1994. A Scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the Western United States. USDA FS. Rocky Mountain Forest and Range Experiment Station. General Specialist Report RM-254. 184p.

Ruggiero, Leonard F., Keith B. Aubry, Steven W. Buskirk, Gary M. Koehler, Charles J. Krebs, Kevin S. McKelvey, and John R. Squires. 1999. Ecology and Conservation of Lynx in the United States. USDA Forest Service, Rocky Mountain Research Station, RMRS-GTR- 30WWW. 480 p.

Saab, Vicki, and Jon Dudley. 1998. Responses of cavity-nesting birds to stand-replacement fire and salvage logging in ponderosa pine/Douglas-fir forest of southwester Idaho. RMRS-RP-11 (Research Paper), USDA Forest Service, Rocky Mountain Research Station, Ogden, UT.

Smith, D.R. 1954. The bighorn sheep in Idaho: Its status life history and management. Boise, ID: Idaho Department of Fish and Game.

Toweill, D.E., and V. Geist. 1999. Return of royalty: wild sheep of North America. Boone and Crockett Club and Foundation for North American Wild Sheep, Missoula, Montana.

USDA Forest Service. 2003. Southwest Idaho Ecogroup Land and Resource Management Plan Final Environmental Impact Statement. USDA Forest Service, Intermountain Region (Region 4), Boise/Payette/Sawtooth National Forests, Ogden, Utah, USA.

USDA Forest Service. Revised July 2003. Boise National Forest land and resource management plan. Two volume set. USDA Forest Service, Intermountain Region, Boise National Forest.

USDA Forest Service. 2004. Intermountain Region (R4) Proposed, Endangered, Threatened, and Sensitive Species List. Technical edits July, 2004. USDA Forest Service, Intermountain Region, Ogden, Utah, USA.

USDA Forest Service MIS Monitoring Data Records. 2010. MIS Monitoring Data Records 2004 through 2010. Cascade Ranger District, Boise National Forest, Cascade, Idaho, USA.

USDA Forest Service and USDI Fish and Wildlife Service. 2008. Memorandum of understanding between the U.S. Department of Agriculture Forest Service and the U.S. Fish and Wildlife Service to promote the conservation of migratory birds. FS Agreement # 08-MU-1113-2400-264.

USDI Fish and Wildlife Service (FWS). 1986. Pacific bald eagle recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon.

USDI Fish and Wildlife Service. 1998. Endangered species consultation handbook. Version March 1998. USDI Fish and Wildlife Service and National Marine Fisheries Service, Washington, D.C., USA.

USDI Fish and Wildlife Service. 2002. Threatened, endangered, proposed and candidate species: biological information and guidance. U.S. Fish and Wildlife Service, Snake River Basin Office, Boise, Idaho.

USDI Fish and Wildlife Service. 2003. Recovery plan for the northern Idaho ground squirrel (Spermophilus brunneus brunneus). USDI Fish and Wildlife Service, Region 1, Portland, Oregon, USA.

USDI Fish and Wildlife Service. 2009. Semi-annual species list update 14420-2010-SL-0089. USDI Fish and Wildlife Service, Snake River Fish and Wildlife Office, Boise, Idaho, USA.

Vogel, C.A., and K.P. Reese. 1995. Mountain quail status report: a preliminary document to a conservation assessment for mountain quail (DRAFT). Prepared for: Eastside Ecosystem Management Project, Walla Walla, Washington.

Wisdom, M.J., R.S. Holthausen, B.C. Wales, C.D. Hargis, V.A. Saab, D.C. Lee, W.J. Hann, T.D. Rich, M.M. Rowland, W.J. Murphy, M.R. Eames. 2000. Source habitats for terrestrial vertebrates of focus in the interior Columbia basin: broad-scale trends and management implications. General Specialist Report PNW-GTR-485. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon, USA.

Wright, V. 1996. Multi-scale analysis of flammulated owl habitat use: owl distribution, habitat, and conservation. M.S. Thesis, University of Montana, Missoula, Montana, USA.

Yensen, E. 1991. Taxonomy and distribution of the Idaho ground squirrel, Spermophilus brunneus. Journal of Mammalogy 72:583-600.

Yensen, E. 1991. Taxonomy and distribution of the Idaho ground squirrel, Spermophilus brunneus. Journal of Mammalogy, 72: 583-600.

Yensen, E, and P.W. Sherman. 1997. Spermophilus brunneus. Mammalian Species, No. 560.

Economics

Boyd, J. and S. Banzhaf. (2007). What Are Ecosystem Services?: The need for standardized environmental accounting units. Ecological Economics 61(4): 716-723.

Combrink, T., Fox, W., and J. Peterson. (2012). Workforce Needs of the Four Forest Restoration Initiative Project: An Analysis. Northern Arizona University, Ecological Restoration Institute.

Knapp, T.A., and P.E. Graves. 1989. .On the Role of Amenities in Models of Migration and Regional Development.. Journal of Regional Science 29(1): 71-87.

Knotek, K., Watson, A.E., Borrie, W.T., Whitmore, J.G., and D. Turner. (2008). Recreation Visitor Attitudes Toward Management-ignited Prescribed Fires in the Bob Marshall Wilderness Complex, Montana. Journal of Leisure Research 40(4): 608-618.

Kochi, I., Donovan, G.H., Champ, P.A., and J.B. Loomis. (2010a). The Economic Cost of Adverse Health Effects from Wildfire-Smoke Exposure: a review. International Journal of Wildland Fire 19: 803-817.

Kochi, I., Loomis, J., Champ, P., and G. Donovan. (2010b). Health and Economic Impact of Wildfires: Literature review. USDA Forest Service.

Lewis, D., G.L. Hunt, and A.J. Plantinga. 2002. "Public Conservation Land and Employment Growth in the Northern Forest Region" Land Economics, 78(2): pp 245-259.

McGranahan, D. 1999. "Natural Amenities Drive Population Change. USDA Economic Research Service. Agricultural Economics, Report #781.

Mercer, D.E., Pye, J.M., Prestemon, J.P., Butry, D.T., and T.P. Holmes. (2000). Economic Effects of Catastrophic Wildfires: assessing effectiveness of fuel reduction programs for reducing the economic impacts of catastrophic forest fire events. Final Report for the Joint Fire Science Program.

Minnesota IMPLAN Group (MIG). (2010). IMPLAN Professional Version 3.0.

Morton, D.C., Roessing, M.E., Camp, A.E., and M.L. Tyrrell. (2003). Assessing the Environmental, Social, and Economic Impacts of Wildfire. Yale School of Forestry and Environmental Studies, GISF Research Paper 001.

Mueser, P.R., and P.E. Graves. 1995. "Examining the Role of Economic Opportunity and Amenities in Explaining Population Redistribution." Journal of Urban Economics 37(2): 176-200.

Treyz, G.I., D.S. Rickman, G.L. Hunt, and M.J. Greenwood. 1993. ."The Dynamics of U.S. Internal Migration." The Review of Economics and Statistics 75(2): 209-14.

Western Forestry Leadership Coalition (WFLC). (2010). The True Cost of Wildfire in the Western U.S. Report of the WFLC.

U.S. Department of Commerce. 2011. Census Bureau, County Business Patterns, Washington, D.C.

U.S. Department of Commerce. 2011b. Bureau of Economic Analysis, Regional Economic Information System, Washington, D.C. Tables CA05, CA05N and CA30.

U.S. Department of Commerce. 2011. Bureau of Economic Analysis, Regional Economic Information System, Washington, D.C. Tables CA05 & CA05N.

U.S. Department of Commerce. 2012. Census Bureau, American Community Survey Office, Washington, D.C.; U.S. Department of Commerce. 2000. Census Bureau, Systems Support Division, Washington, D.C.

U.S. Department of Commerce. 2012b. Census Bureau, American Community Survey Office, Washington, D.C.

U.S. Department of Labor. 2011. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, Washington, D.C.

U.S. Department of Labor. 2012. Bureau of Labor Statistics, Local Area Unemployment Statistics, Washington, D.C.

Appendix H. Glossary and Acronyms

Air quality—The composition of air with respect to quantities of pollution therein; used most frequently in connection with "standards" of maximum acceptable pollutant concentrations.

Allotment (grazing)—Area designated for the use of a certain number and kind of livestock for a prescribed period of time.

Alternative—In an Environmental Impact Statement (EIS) or Environmental Assessment (EA), one of a number of possible options for responding to the purpose and need for action.

Analysis area—One or more areas grouped for purposes of analysis of a specific resource based on common impacts, effects, and social or economic factors.

Aquatic Conservation Strategy (ACS)—"A long-term strategy to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within lands administered by National Forests," page B-48, Forest Plan, 2003 as amended.

Beneficial use (designated use)—Use specified in water quality standards for each waterbody or segment whether or not it is being attained. Types of uses include public water supplies; protection and propagation of fish, shellfish, and wildlife; recreation; agriculture; industry; navigation; marinas; groundwater recharge; aquifer protection; and hydroelectric power.

Best Management Practice (BMP)—Methods, measures, or practices selected by an agency to meet its nonpoint source control needs. BMPs include but are not limited to structural and nonstructural controls and operation and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters (36 CFR 219.19).

Biological Assessment (BA)—A document required by the Endangered Species Act (ESA), prepared by the fisheries and wildlife biologists to determine the effects of the proposed project on federally listed fish and wildlife species, as well as species proposed for federal listing, and designated and proposed critical habitat for listed species. The document provides an official determination of effects for each species. Following review by the District Ranger and the Forest fisheries or wildlife biologist, the BA is reviewed by the U.S. Fish and Wildlife Service (USFWS) and NOAA Fisheries, through a process called consultation. The USFWS and NOAA Fisheries can suggest changes to the project, or concur with the biologists' determinations and mitigations.

Biological Evaluation (BE)—A document prepared by the fisheries and wildlife biologists to determine if there are effects to listed species. If so, then a BA is completed. The BE also is used to determine the effects of the proposed project on Region 4 sensitive species and migratory bird species habitats.

Biological Opinion (BO)—A document resulting from formal consultation that states the opinion of USFWS or NOAA fisheries as to whether a federal action is likely to jeopardize the continued existence of listed species or their habitat.

Biomass—A renewable energy source, a biological material from living, or recently living organisms, such as wood, waste, (hydrogen) gas, and alcohol fuels. Relevant to this project, biomass includes forest product material derived from woody material, not meeting sawlog specifications that is typically chipped at landings and removed for burning in a plant that utilizes the energy produced during combustion for electricity generation. This material is

typically tops of trees, branches and cull material or trees smaller in diameter than those that meet sawtimber specifications (see Sawtimber).

Board foot—A measurement of wood equivalent to a board 1-foot square and 1 inch thick. Usually expressed in terms of thousand board feet (MBF) or million board feet (MMBF).

Broadcast burning—Burning forest fuels as they are, with no piling or windrowing.

Canopy—The more-or-less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth.

Canopy closure—Canopy closure represents the total non-overlapping crown closure of all trees in a stand, excluding the seedling tree size class. Trees in the seedling tree size class are used to estimate canopy closure class only when they represent the only structural layer present. Canopy closure classes are based on the following:

- Low = 10–39% canopy closure
- Moderate = 40–69% canopy closure
- High = 70% or more canopy closure

Commercial thin—Any type of thinning that produces merchantable material at least equal to the value of the direct cost of harvesting.

Condition class—The degree of departure from historical fire regimes and vegetation characteristics.

Critical Habitat— Specific areas within a geographical area occupied by a threatened or endangered species, on which are found physical or biological features essential to conservation of the species.

Cultural resources—Cultural resources include sites, structures, or objects used by prehistoric and historic residents or travelers. They are non-renewable resources that tell of life-styles of prehistoric and historic people. Cultural resources within the Forests are diverse and include properties such as archaeological ruins, pictographs, early tools, burial sites, log cabins, mining structures, guard stations, and fire lookouts.

Cumulative effects—Impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

Cut slope—that portion of the slope that is excavated for road construction, trails, landings, or skidtrails.

DBH (diameter at breast height)—Diameter at breast height. The diameter of a tree measured 4 feet 6 inches above the ground, uphill side.

Denning habitat or sites—Habitat and locations used by mammals during reproduction and rearing of their young, when the young are highly dependent on adults for survival.

Desired Condition (DC)—Also called Desired Future Condition, a portrayal of the land, resource, or social and economic conditions that are expected in 50-100 years if management goals and objectives are achieved. A vision of the long-term conditions of the land.

Detrimental soil disturbance (DD)—The alteration of natural soil characteristics that results in immediate or prolonged loss of soil productivity and soil-hydrologic conditions. Detrimental disturbance can occur from soil that has been displaced, compacted, puddled or severely burned.

Disturbance—Any event, such as wildfire or a timber sale that alters the structure, composition, or function of an ecosystem.

Ecosystem—A naturally occurring, self-maintained system of living and non-living interacting parts that are organized into biophysical and human dimension components.

Ecosystem health—A condition where the components and functions of an ecosystem are sustained over time and where the system's capacity for self-repair is maintained, such that goals for ecosystem uses, values, and services are met.

Effective cover- (in Forest Plan glossary, listed as "effective ground cover")—Vegetation, litter, and rock fragments larger than ¾" in diameter. Expressed as the percentage of material, other than bare ground, covering the land surface. May include live vegetation, standing dead vegetation, litter, cobble, gravel, stones, and bedrock. This cover contributes to preventing soil erosion.

Endangered species—Designated by the USFWS or NOAA Fisheries, in accordance with the Endangered Species Act (ESA), an animal or plant species, or critical habitat, that has been given federal protection status, because it is in danger of extinction throughout all or a significant portion of its natural range.

Endemic—A plant or animal native to the local area.

Environmental Impact Statement (EIS)—A document required of federal agencies by the National Environmental Policy Act (NEPA) for major projects or legislative proposals significantly affecting the environment. A tool for decision making, it describes the positive and negative effects of the undertaking and cites alternative actions.

Ephemeral stream—A stream or portion of a stream that flows only in direct response to precipitation or run-off events, and that receives little or no continuous water from springs, snow, or other sources. Unlike intermittent streams, an ephemeral usually does not have a defined stream channel or banks, and its channel is at all times above the water table.

Erosion—This includes processes of weathering, solution, corrosion, and transportation of earth and rock materials. Forces involved may be water, ice, wind, and gravity.

Executive Order (EO)—Executive orders are official documents, numbered consecutively, through which the President of the United States manages the operations of the federal government.

Family—A collection of focal species that share similarities in source habitats, with the similarities arranged along major vegetative themes.

Fill—Earth or rock moved during road construction and used to build up portions of the roadway.

Fill slope—The sloping earth surface on the downhill side of a road resulting from roadway excavation.

Fine fuels—Cured grasses, leaves, needles, twigs, and small branches that ignite easily and carry fire rapidly.

Fire Intensity- the rate of heat release from a fire.

Fire regimes—The characteristics of fire in a given ecosystem, including factors such as frequency, intensity, severity, and patch size.

Fire severity—Effects of fire as it relates to vegetation, soils, fuels, or any item measured or discussed.

Forest plan—In this document, the Payette National Forest Land and Resource Management Plan (2003).

Forest Road—As defined in Title 23, Section 101 of the United States code, any road wholly or partly within, or adjacent to, that serves the NFS and that is necessary for the protection, administration, and utilization of the NFS and the use and development of its resources.

Fuel treatment—The rearrangement or disposal of natural or activity fuels to reduce the fire hazard. Fuels are defined as both living and dead vegetative materials consumable by fire.

Geographic Information System (GIS)—A computer system that stores and uses spatial (mapable) data.

Goal—As Forest Plan management direction, a goal is a concise statement that helps describe a desired condition, or how to achieve that condition.

Guideline—As Forest Plan management direction, a guideline is a preferred or advisable course of action generally expected to be carried out. Deviation from compliance does not require a Forest Plan amendment (as with a standard), but rationale for deviation must be documented in the project decision document.

IDT or ID Team - (Interdisciplinary Team)—A team of individuals with skills from different disciplines that focus on the same task or project.

Indicator—In effects analysis, a way or device for measuring effects from management alternatives on a particular resource or issue.

Indirect effects—Impacts caused by an action but occurring later in time or farther removed in distance.

Insignificant effect—An insignificant effect is one that cannot by detected, measured, or evaluated in any meaningful way.

Intermittent stream—A stream or portion of a stream that flows only in direct response to precipitation or seasonal run-off, and that receives little or no water from springs or other permanent sources. Unlike ephemeral streams, an intermittent has defined channel bed and bank, and it may seasonally be below the water table.

Irretrievable commitments—Losses of production or use for a period of time. An example is suited timberland being used for a skid trail. Timber growth on the land is irretrievably lost while the land is a skid trail, but the timber resource is not irreversibly lost because the land could grow trees again in the near future.

Irreversible commitments—Permanent or essentially permanent resource uses or losses that cannot be reversed, except in the extreme long term. Examples include minerals that have been extracted or soil productivity that has been lost.

Issue—A public or agency concern about a specific action or area that is addressed in the NEPA process.

Knutson-Vandenburg Act (KV)—In 1930, Congress passed the Knutson-Vandenburg Act (KV Act) to authorize collection of funds (KV Funds) for reforestation and timber stand improvement on areas cut over following a timber sale. Funds are to be used to protect and improve the future productivity of renewable resources on timber sale areas.

Ladder fuels—Continuous vertical vegetation that connects surface fuels to the crown fuels of overstory trees, forming a ladder by which a fire can spread into tree or shrub crowns (DeBano et al. 1998).

Landform—A natural feature of the land surface such as a mountain, valley, or ridge.

Landing—A location (usually cleared and level) where logs are stored or loaded onto logging trucks for transport.

Landslide prone—Land that has a probability of mass movement greater than or equal to 10% during a period of 100 years.

Landtype—A portion of the landscape resulting from geomorphic and climatic processes with defined characteristics having predictable soil, hydrologic, engineering, productivity, and other behavior patterns.

Landtype associations—A grouping of landtypes similar in general surface configuration and origin.

Legacy tree – Older trees that have survived recent disturbances and are a relic of historical communities. These trees are important because they exhibit definitive characteristics and contribute to ecosystem function in a different manner than younger trees.

Long-term—For environmental effects, greater than 15 years. See short-term and temporary.

Long-term road closure—Roads placed in maintenance level 1 and receiving treatments to keep damage to adjacent resources to an acceptable level, and to perpetuate the road to facilitate future management activities. These roads were identified as not needed for project use for more than 15 years. Closure activities could include removing man-made drainage structures, restoring stream channel and banks, providing for drainage (waterbars), scarifying, seeding, and fertilizing.

Lop and scatter—When branches are cut from fallen trees and scattered over the area rather than piled for burning. This allows the slash to lie close to the ground to reduce the fire hazard and accelerate decomposition.

Management Area—A land area with similar management goals and a common prescription, as described in the Forest Plan.

Management direction—Activities that must be carried out to meet the goals of agency management.

Management Indicator Species (MIS)—Representative species whose habitat conditions or population changes are used to assess the impacts of management activities on similar species in a particular area. MIS are generally presumed to be sensitive to habitat changes.

Management Prescription Category (MPC)—Management prescriptions are defined as, “Management practices and intensity selected and scheduled for application on a specific area to attain multiple use and other goals and objectives” (36 CFR 219.3). MPCs are broad categories of management prescriptions that indicate the general management emphasis prescribed for a given area. They are based on Forest Service definitions developed at the national level, and represent management emphasis themes, ranging from Wilderness (1.0) to Concentrated Development (8.0). The national MPCs have been customized during Forest Plan revision to better fit the needs and issues of the Southwest Idaho Ecogroup Forests.

Market value—The price that timber and wood products would bring if sold today.

MBF and MMBF—One thousand board feet, and one million board feet, respectively.

Merchantable (timber)—Trees or stands of size and quality suitable for marketing and utilization.

Mitigation—Actions to avoid, minimize, reduce, eliminate, or rectify the impact of a management practice.

Mixed conifer—Stands on the Payette National Forest composed primarily of ponderosa pine, Douglas-fir, and grand fir.

Monitoring—The process of collecting information to evaluate if objectives and anticipated results of a management plan are being realized, or if implementation is proceeding as planned.

Mortality (stand)—The number or volume of trees that died because of fire, insects, disease, climatic factors, or competition from other trees or vegetation.

National Environmental Policy Act (NEPA)—The National Environmental Policy Act of 1969 requires environmental analysis and public disclosure of federal actions.

National Fire Plan (NFP)—Strategic and implementation goals, budget requests and appropriations, and agency action plans to address severe wildland fires, reduce fire impacts on rural communities, and ensure effective firefighting capability in the future.

National Forest Management Act (NFMA)—A law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act requiring the preparation of Regional Guides and Forest Plans and the preparation of regulations to guide that development.

National Register of Historic Places (NRHP)—A list of cultural resources that have local, state, or national significance maintained by the Secretary of the Interior.

Native species—Animals or plants that originated in the area in which they live. Species that normally live and thrive in a particular ecosystem.

Natural fuel—The combustible material resulting from natural processes and not directly generated or altered by land management practices.

No action (alternative)—The most likely condition expected to exist if current management practices continue unchanged. The analysis of this alternative is required for federal actions under NEPA.

Non-point pollution—Pollution that emanates from diffuse and intermittent sources.

Noxious weed—A state-designated plant species that causes negative ecological and economic impacts to both agricultural and other lands within the state.

No-cut zone – The area along intermittent and perennial streams where no trees would be cut.

Obliteration – road decommissioning treatment that fully removes the road prism by recontouring the cut and fill to match the original slope contour and initiates native vegetative cover.

Objective—As Forest Plan management direction, an objective is a concise time-specific statement of actions or results designed to help achieve goals. Objectives form the basis for project-level actions or proposals to help achieve Forest goals. The time frame for accomplishing objectives, unless otherwise stated, is generally considered to be the planning period, or the next 10 to 15 years. More specific dates are not typically used because achievement can be delayed by funding, litigation, environmental changes, and other influences beyond the Forest's control.

Open road density—Miles of open road per square mile.

Opening (created) -Related to vegetation management, openings are created only by planned, even-aged, regeneration timber harvesting. Only those even-aged timber harvest practices that reduce stocking levels to less than 10% create openings. Canopy closure will normally be used to determine stocking levels. Residual stands of mature trees will generally have less than 10% stocking when fewer than 10 to 15 trees per acre remain following harvest.

Overstory—That portion of the trees, in a Forest of more than one story, forming the upper or uppermost canopy.

Overstory removal—Removal of most or all of the trees forming the uppermost canopy in a two or multi storied stand. The remaining trees are of good quality and will be managed as the next crop of trees on the site.

Perennial stream—A stream that typically maintains year-round surface flow, except possibly during extreme periods of drought. A perennial stream receives its water from springs or other permanent sources, and the water table usually stands at a higher level than the floor of the stream.

Potential Vegetation Group (PVG)—Potential vegetation types grouped on the basis of a similar general moisture or temperature environment.

Prescribed fire—Any fire ignited by management actions to meet specific objectives.

Private Road—A road located on private land within the National Forest boundary.

Project area—The area bounding all management activities associated with a project. This area is greater than the total acres treated; some analysis of effects to resources may be appropriate at this scale and others may occur at the activity area level and not include the entire project area.

Proposed action—A proposal made by the Forest Service or other federal agency to authorize, recommend, or implement an action to meet a specific purpose and need.

Proposed species—Species that are proposed to the US Fish and Wildlife Service or NOAA Fisheries for threatened or candidate status.

Proposed endangered—Taxa proposed to be listed as endangered.

Proposed threatened—Taxa proposed to be listed as threatened.

Recontour—Reestablish the natural slope of the land where a road has been located. This may involve pulling the fill material up onto the road surface and/or bringing in material to replace that, which was removed to build the road.

Recreation Opportunity Spectrum (ROS)—A framework for stratifying and defining classes of outdoor recreation environments, activities, and experience opportunities. The settings, activities, and opportunities for obtaining experiences are arranged along a continuum or spectrum divided into six classes--primitive, semiprimitive nonmotorized, semiprimitive motorized, roaded natural, rural, and urban.

Reforestation—The natural or artificial restocking of an area with Forest trees.

Regeneration—The renewal of a tree crop, whether by natural or artificial means. Also, the young crop itself, which commonly is referred to as reproduction.

Restore—For biological and physical resources, restore means to repair, re-establish, or recover ecosystem functions, processes, or components so that they are moving toward or within their range of desired conditions. For the Recreation, Scenic Environment, Heritage, Lands, Special Uses, Wilderness, Roads and Facilities resources, restore means to use management actions to re-establish desired resource conditions.

Revegetation—The reestablishment of plant cover, either naturally or by manually seeding.

Riparian—Relating to the banks of natural watercourses such as rivers or streams.

Riparian Conservation Areas (RCAs)—Portions of watersheds where riparian-dependent resources receive primary emphasis, and management activities are subject to specific goals, objectives, standards, and guidelines. RCAs include traditional riparian corridors, perennial and intermittent streams, wetlands, lakes, springs, reservoirs, and

other areas where proper riparian functions and ecological processes are crucial to maintenance of the area's water, sediment, woody debris, nutrient delivery system, and associated biotic communities and habitat.

Ripping—Breaking up a compacted surface to a depth of at least 16 inches.

Road -A motor vehicle travelway over 50 inches wide, unless designated and managed as a trail. A road may be classified, unclassified, or temporary.

Road construction— see New road construction.

Road decommissioning—Activities that result in the stabilization and restoration of unneeded roads to a more natural state (36 CFR 212.1, FSM 7703). The goal for decommissioning of system roads and for treatment of unauthorized routes in this project is to re-establish hillslope hydrologic function and long-term soil productivity. Treatments would include the following:

- Reestablishing former drainage patterns, stabilizing slopes, and restoring vegetation;
- Removing culverts, reestablishing drainages, removing unstable fills, pulling back road shoulders, and scattering slash on the roadbed;
- Completely eliminating the roadbed by restoring natural contours and slopes

Road maintenance— The ongoing upkeep of a road necessary to retain or restore the road to the approved road management objective.

Road Maintenance Level -

Road reconstruction—Activity that results in improvement or realignment of an existing classified road as defined below:

Road improvement — Activity that results in an increase of an existing road's traffic service level expansion of its capacity, or a change in its original design function.

Road maintenance—The ongoing upkeep of a road necessary to retain or restore the road to the approved road management objective.

Road realignment—Activity that results in a new location of an existing road or portions of an existing road and treatment of the old roadway (36 CFR 212.1).

Road reconstruction—Activity that results in improvement or realignment of an existing classified road.

Scoping—The process the Forest Service uses to determine, through public involvement, the range of issues that the planning process should address.

Seasonally open road—Roads open to motorized use on a seasonal basis (e.g., closed during hunting season).

Section 106 review- A review required by the National Historic Preservation Act to determine effects of a federal action on cultural resources.

Section 7 Consultation—Consultation required by the Endangered Species Act with the appropriate jurisdictional agency for a listed species.

Sediment—Any solid material (mineral and organic) that has been moved to a water body and is being transported or has been deposited.

Sensitive species—A Forest Service or BLM designation, sensitive plant and animal species are selected by the Regional Forester or the BLM State Director because population viability may be a concern, as evidenced by a current or predicted downward trend in population numbers or density, or a current or predicted downward trend in habitat capability that would reduce a species' existing distribution. Sensitive species are not addressed in or covered by the Endangered Species Act.

Seral—The unique characteristics of a biotic community that is a developmental, transitory stage in an orderly ecological succession involving changes in species, structure, and community processes with time.

Short term—For environmental effects, greater than 3 to 15 years. See temporary and long term.

Short-term road closure—Roads placed in maintenance level 1 and closed to vehicular traffic for greater than one year. Basic custodial maintenance is performed to keep damage to adjacent resources 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.

Silvicultural prescription—The method selected to manage a forest stand. Silvicultural prescriptions are broken into broad types, including even aged and uneven aged. Even aged prescriptions include clearcut, seed tree, and shelterwood. Uneven aged prescriptions include individual tree selection and group selection. Other non regeneration prescriptions include thinning and sanitation/salvage cuttings.

Silviculture –The care and tending of stands of trees to meet specific objectives.

Site potential tree height—For delineating RCAs, a site potential tree height is the height that a dominant or co-dominant tree within a stand is expected to attain at an age of 200 years. Outside of RCAs, a site potential tree height is the average height that the dominant or co-dominant tree within a stand will attain within 100 years.

Site preparation—A general term for removing unwanted vegetation, slash, roots, and stones from a site before reforestation.

Skid trail—A route used by loggers to drag logs from stump to landing.

Skidding—A loose term for hauling trees by sliding, not on wheels, from stump to roadside, deck, skidway, or other landing.

Skyline logging—A logging system using steel cable, a tower, and a powered winch to elevate logs from their position in the woods and carry them suspended to a point where they can be loaded on to trucks.

Slash—The residue left on the ground after timber cutting and/or accumulation as a result of storm, fire, or other damage. It includes logs, uprooted stumps, broken or uprooted stems, branches, twigs, leaves, bark, and chips.

Slash filter windrow-- Woody debris placed along a slope to trap and hold sediment coming off a hill or road above.

Snag—standing dead tree.

Soil compaction—Where one or more of the following conditions occurs in relation to natural: a 50% reduction in macropore space; less than 15% macropore space, total; 15% increase in soil bulk density; or a 40% reduction in hydraulic conductivity.

Soil erosion—Soil erosion is the detachment and transport of soil particles or aggregates by wind, water, or gravity. Management practices may increase soil erosion hazard when they remove ground cover and detach soil particles. .

Soil productivity—Soil productivity includes the inherent capacity of a soil under management to support the growth of specified plants, plant communities, or a sequence of plant communities. Soil productivity may be

expressed in terms of volume or weight/unit area/year, percent plant cover, or other measures of biomass accumulation.

Source Habitat—Source habitats are those characteristics of macrovegetation (i.e., cover types and structural stages) that contribute to stationary or positive population growth for a species in a specified area and time (Wisdom et al. 2000).

Species composition—The different tree species within a stand, usually expressed as a percentage within each age class.

Stand—An aggregation of trees or other vegetation occupying a specific area and sufficiently uniform in composition (species), age arrangement, and condition as to be distinguishable from the Forest or other vegetation of land cover on adjoining areas.

Stand density—A measure of how crowded a stand is. Measures of density include: trees per acre, square feet of basal area, stand density index (SDI), and percent of maximum SDI.

Stand initiation—A stage of stand development following a disturbance when new individuals and species continue to appear for several years (Oliver and Larson 1996).

Stand structure—The different sizes and ages of trees within a stand.

Standard—As Forest Plan management direction, a standard is a binding limitation placed on management actions. It must be within the authority and ability of the Forest Service to enforce. A project or action that varies from a relevant standard may not be authorized unless the Forest Plan is amended to modify, remove, or waive application of the standard.

State Historic Preservation Officer (SHPO)—A person appointed by a state's Governor to administer the State Historic Preservation Program.

Subwatershed—An area of land that drains to a common point. A subwatershed is smaller subdivision of a watershed but is larger than a drainage or site.

System roads — Roads wholly or partially within or adjacent to national Forest System lands that are determined to be needed for long-term motor vehicle access. System roads can include state roads, county roads, privately owned roads, NFS roads, and other roads authorized by the Forest Service.

Temporary road—Roads authorized by contract, permit, lease, other written authorization, or emergency operation, that are not intended to be a part of the forest transportation system, that are not necessary for long-term resource management, and that is not a forest road or a forest trail and that is not included in a forest transportation atlas.

Thinning—A cultural treatment made to reduce stand density of trees primarily to improve growth, enhance forest health, or recover potential mortality (Helms 1998). Types of thinning include the following: Crown thinning—the removal of trees from the dominant and codominant crown classes in order to favor the best trees of those same crown classes- synonym thinning from above. Free thinning—The removal of trees to control stand spacing and favor desired trees, using a combination of thinning criteria without regard to crown position. Low thinning—The removal of trees from the lower crown classes to favor those in the upper crown classes—synonym thinning from below.

Threatened species—Designated by the FWS or NOAA Fisheries, in accordance with the Endangered Species Act; a plant or animal species, or critical habitat, given federal protection, because it is likely to become endangered throughout all or a significant portion of its range within the foreseeable future.

Timber sale contract—The binding document between the Forest Service and timber purchaser that states, among other things, how the sale will be logged.

Timber Stand Improvement (TSI)—An intermediate treatment made to improve the composition, structure, condition, health, and growth of even or uneven aged stands.

Total Maximum Daily Load (TMDL)—TMDL is the sum of waste load allocations for point sources, non-point sources, natural background, and a margin of safety. A TMDL specifies the amount of a pollutant that needs to be reduced to meet water quality standards set by the state. TMDL is used in a process to attain water quality standards that (1) identifies water quality problems and contributing pollutant sources, (2) allocates pollution control responsibilities among sources in the watershed, and (3) provides a basis for taking actions needed to restore a water body.

Total Soil Resource Commitment (TSRC)—A measure of how much land in a project area is converted to a non-productive condition (less than 40% of natural productivity rates) for 50 years or more. Examples are permanent skid trails, landings, roads, campgrounds, administrative sites, and recreational trails.

Tractor logging—Any logging method, which uses a tractor as the motive power for transporting logs from the stumps to a collecting point—whether by dragging or carrying the logs.

Unauthorized Road or Trail—Roads on NFS lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travelways, and off-road vehicle tracks that have not been designated and managed as trails. Non-system roads also include those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization (36 CFR 212.1).

Underburn—A light broadcast burn under an existing forest canopy. A fire prescribed to reduce fuels without damaging existing trees.

Watershed Condition Framework (WCF) – The WCF is a comprehensive approach for proactively implementing integrated restoration on watersheds located on national forests and grasslands. It provides the Forest Service with an outcome-based performance measure for documenting improvement to watershed condition at forest, regional, and national scales.

Watershed Condition Indicator (WCI)—WCIs are an integrated suite of aquatic (including biophysical components), riparian (including riparian –associated vegetation species), and hydrologic (including uplands) condition measures that are intended to be used at a variety of watershed scales. They assist in determining the current condition of a watershed and should be used to help design appropriate management actions, or to alter or mitigate proposed and or ongoing actions, to move watersheds toward desired conditions. WCIs represent a diagnostic means to determine factors of current condition and assist in determining future conditions associated with implementing management actions or natural restoration over time.

Acronyms

ACS – Aquatic Conservation Strategy

AMP – Allotment Management Plan

AOI – Annual Operating Instructions

AOP – Aquatic Organism Passage

ATV – All Terrain Vehicle

BA – Biological Assessment

BMP – Best Management Practice

BO – Biological Opinion

CEQ – Council on Environmental Quality

CFLRA - Collaborative Forest Landscape Restoration Act

CFR – Code of Federal Regulations

CT-FT – Commercial Thin-Free Thin

CT-MP – Commercial Thin Mature Plantations

DBH – diameter breast height

DCH – Designated Critical Habitat

DEIS – Draft Environmental Impact Statement

DD – Detrimental Disturbance

ECA – Equivalent Clearcut Area

EIS – Environmental Impact Statement

EPA – Environmental Protection Agency

ESA – Endangered Species Act

FA – Functioning Appropriately

FEIS – Final Environmental Impact Statement

FMO – Fuels Management Officer

FR – Functioning at Risk

FRCC – Fire Regime Condition Class

FSH – Forest Service Handbook

FT-PC – Free Thin – Patch Cut

FUR – Functioning at Unacceptable Risk

GFSS - grass/forb/shrub/seedling

GIS – Geographic Information System

GRAIP - Geomorphic Road Analysis and Inventory Package

HRV – Historic Range Of Variability

ICBEMP –Interior Columbia Basin Ecosystem Management Project

IDFG – Idaho Department Of Fish And Game

IRA – Inventoried Roadless Area

LSP – Landslide Prone Area

LTC – Long Term Closure

LWD – Large Woody Debris

MA – Management Area

MIS – Management Indicator Species

MPC – Management Prescription Category

MRS – Minimum Road System

MVUM – Motor Vehicle Use Map

NCT – Non-Commercial Thinning

NFMA – National Forest Management Act

NIDGS – Northern Idaho Ground Squirrel

NOGO – Northern Goshawk

NOI – Notice of Intent

OHV – Off-Highway Vehicle

PFC – Payette Forest Coalition

PVG – Potential Vegetation Group

RCA – Riparian Conservation Area

PDF – Project Design Feature

ROD – Record of Decision

ROS – Recreational Opportunity Spectrum

RNA – Research Natural Area

SHPO – State Historic Preservation Office

SOPA – Schedule Of Proposed Actions

SWCP – Soil and Water Conservation Practices

SWRA – Soil, Water, Riparian, and Aquatic Resources

TAP – Travel Analysis Process

TEPC – Threatened, Endangered, Proposed And Candidate Species

TES – threatened or endangered species

TMDL – Total Daily Maximum Load

TSA – Timber Sale Administrator

TSRC – Total Soil Resource Commitment

USACE – United States Army Corps of Engineers

USDA – United States Department Of Agriculture

USFWS – US Fish and Wildlife Service

VQO – Visual Quality Objective

WCF – Watershed Condition Framework

WCI - Watershed Condition Indicator

WCS – Wildlife Conservation Strategy

WFW – West Fork Weiser River