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Appendix A -- Other Resource Concerns

Appendix A sections A.1 and A.2 include resource concerns that were eliminated from detailed study because the alternatives listed in Chapter 2 will either have no effect on them, or potential effects were limited/reduced through design of the alternatives. Potential effects to these other resources did not warrant development of other alternatives.

Section A.3 includes background information on past timber harvest activities within the project area. The level of analysis for these activities is discussed in sub-section A.3-a and pertinent individual past harvest activities are discussed where appropriate in Chapters 3 and 4.

Section 4 contains the soils report for this project, portions of which are also included in the main body of the SFEIS.

A.1 Biodiversity

a. Wildlife

Threatened, Endangered and Sensitive Species
Species presumed present, but not necessarily affected by the proposed action, are not analyzed in detail. Supporting rationale for these species is included in the Wildlife report in Appendix B: common loon, white-headed woodpecker, Townsend's big-eared bat, wolverine, Coeur d'Alene salamander, and northern leopard frog,.

Management Indicator and Other Species
The following species are presumed present, but not necessarily affected by the proposed action and were not analyzed in detail: American marten, Rocky Mountain elk, and snag habitat. Refer to Appendix B or the project file for more detailed information.

Species Not Analyzed in Detail
A few species did not require detailed discussion and analysis because the species or their habitat is presumed not be be present within the affected area. The rationale for no further analysis for the following species can be found in the Mission Brush project file: woodland caribou (T&E), bald eagle (T&E), harlequin duck (sensitive), peregrine falcon(sensitive), and nothern bog lemming (sensitive).

Habitat Linkages
Cover linkages between forested habitats allow species to travel between suitable habitats. Species differ in their ability to move between fragmented habitats. Some move freely while others will not cross even rather narrow gaps of open habitat. The proposed actions would not have a measurable effect on any linkages within or outside the project area. Consequently, no measurable direct, indirect, or cumulative effects on habitat linkages are expected.

b. Risk of Noxious Weeds

Increased travel from both timber harvest activities and recreation use can introduce and distribute the seeds of noxious weeds. Ground disturbed areas, such as landings and especially road shoulders, provide suitable habitat for many weed species. Most of the noxious weeds are very aggressive and tend to dominate over natural vegetation for use of the habitat. A weed monitoring and control program would be implemented under the KV plan if funding is available. If this becomes a priority treatment area for noxious weeds the District will seek appropriated funds. Timber sale contract provisions would be used to guarantee treatment of haul routes and landings in the project area for noxious weeds. To prevent further infestation, only certified weed free seed would be used to seed road shoulders, temporary roads, skid trails, and landings. Identified existing weed infestations within the project area would be treated according to guidelines established in the Bonners Ferry Weed Control Projects EIS (USDA 1995). Monitoring and the environmental effects of weed control are also covered in the EIS.

No significant direct, indirect, or cumulative effects from noxious weeds are expected from implementation of any alternative.

c. Native Plant Species

In an effort to implement ecosystem management, the Regional Office has issued direction on the use of native plant species for revegetation projects. The basic policy requires the use of native plant seed in erosion control, fire

rehabilitation, riparian restoration, forage enhancement, and other vegetation projects, to the extent practicable. The purpose of this direction was to emphasize the importance of biodiversity, and to recognize the intrinsic value of native plant vegetation as a component of natural forest and rangeland ecosystems. This information is contained in a letter, dated June 8, 1993, written to the Region 1 Forest Supervisors by the Regional Forester. A copy of this letter may be found in the project file.

d. Fish – Threatened, Endangered and Sensitive Species

Refer to Appendix B for discussions of the following species: white sturgeon, bull trout, torrent sculpin, interior redband trout, and burbot. More information is also contained in the Watershed and Fisheries project file. Detailed analysis and discussions of the following species are located in Chapter 4: westslope cutthroat trout and rainbow trout.

e. Range

There are no federally permitted range allotments within the analysis area. For these reasons, there would be no measurable direct, indirect, or cumulative effects on these range allotments.

A.2 Social/Economic Factors

a. Cultural Resources

Cultural resource surveys of the project area have been completed as directed by the Cultural Resources Management Practices (Forest Plan, Appendix FF). The cultural resource inventories are on file for selective review at the Bonners Ferry Ranger Station. Numerous sites have been recorded, and a determination made to the extent of protection required. These sites would be protected under all alternatives. Any future discovery of cultural resource sites would be inventoried and protected if found to be of cultural significance. A decision would be made to avoid, protect, or mitigate the impact to these sites in accordance with the National Historic Preservation Act of 1966. Currently, there are no known districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places that would be affected by the proposed actions. As such, the actions should not cause the loss or destruction of significant scientific, cultural, or historic resources.

b. Economics / Community Stability

The proposed sale is on productive forestland and could be offered with minimal investment. Estimated timber volume removed under Alternative 2 would be about 23.5 million board feet (MMBF). The timber sale appraisal conducted for this volume of timber estimated that the advertised rate for the sale of timber would be about $117 per thousand board feet (MBF). Past history on the Bonners Ferry Ranger District has shown that these types of sales are often bid up to twice their advertised rate, in this case $234/MBF would not be unusual. This would be far in excess of the estimated $75/MBF it costs the district to prepare a sale. The direct and cumulative effects of each alternative would be related to the costs and revenues generated by each.

- Alternative 1 would generate no revenues and no costs.
- Alternative 2 is expected to generate a minimum of $2,700,000 in net revenues. Alternative 2 would not only generate revenues to the Federal Treasury and to USFS trust funds (KV and BD), which could be used to offset the costs of reforestation and fuels reduction, but, Alternative 2 would also provide local employment opportunities for loggers, mill workers, equipment operators (i.e., for grapple piling, fire line construction, etc.), and reforestation crews.
- Alternative 3 would generate about $2,000,000 to implement restoration treatments and provide some of the same employment opportunities as Alternative 2.
- Alternative 4 would generate about $992,000 to implement restoration treatments and provide some of the same employment opportunities as Alternative 2.

The indirect effects of each alternative would be related to future costs of maintaining healthy forested conditions in the project area. Forests that are managed within their historic range will generally be more sustainable and less costly to maintain. Under Alternative 1, the risk of severe fire would increase over time, which could lead to increased fire suppression costs, and restoration costs related to restoring ecosystem functions. Alternative 2 would reduce the risk of severe fire in both the short and long-term by trending stands toward historic conditions, which would reduce the potential suppression and restoration costs. Alternatives 3 and 4 vary in scale yet proportionally reduce the risk of severe fire in both the short and long-term by trending stands toward historic conditions, which would reduce the potential suppression and restoration costs.

Documentation of the analysis and considerations for community stability is contained in the Final Environmental Impact Statement for the IPNF Forest Plan. Given the potential employment opportunities projected under Alternatives 2, 3 and

4, it is beyond the scope of this document to assess potential impacts to community stability in great detail. However, a general assessment could be made that Alternative 2 would provide a greater number of employment opportunities, and greater diversity of employment opportunities, within Boundary County. Alternatives 3 and 4 would provide most of the same types of opportunities, but to a lesser amount than Alternative 2. Alternative 1 would provide none of the employment opportunities to help sustain community stability provided by the action alternatives.

c. Visual Quality

Through the scoping process it was determined that scenery management was not a significant issue that would drive alternative development. However, maintaining or improving the scenic integrity would be prudent for that portion of the project area that can be viewed from adjacent residences as well as by recreationists and other casual forest observers in the Hall Mountain, Brush Lake, and Mission Creek areas. All of these units will easily meet the Forest Plan Visual Quality Objectives or the newly adopted Scenic Integrity Objectives. The Mission Brush Visual Analysis Report is located in the project file.

d. Minerals

Montgomery Mine is only operation with current claim within the assessment area. None of the alternatives will change the access or have a direct indirect or cumulative effect on the mine.

e. Roadless Areas

There are no roadless areas within the assessment area.

f. Public Health and Safety

Many of the items described in "Common Featurs, Required Design Criteria and Estimated Effectiveness" for all Action Alternatives (Chapter 2. section 2.8), ensure consideration of public health and safety.

g. Effects on Minority Populations and Low-income Populations

The Kootenai Tribe of North Idaho is being consulted concerning sensitive areas that may be in the project area. No other minority other low-income populations that could potentially be impacted by any of the alternatives are located within the project area. See Chapter 2 for more information.

h. Water Resources and Aquatics

Microbial Contaminants

Wildlife populations and their use of the riparian areas are not expected to appreciably increase as a result of implementing any of the alternatives. The Best Management Practice (BMP) promoting appropriate disposal of human waste, the goals of reducing sediment production and delivery, and protection of the Riparian Habitat Conservation Areas (RHCAs) are all consistent with preventing delivery of microbial contaminants to the stream network. Consequently, there will be no direct, indirect, or cumulative effects from microbial contaminants

Inorganic Contaminants

Water quality can be reduced by contaminants such as salts or metals. These elements can be naturally occurring or can be delivered from roads that are treated with magnesium chloride or calcium chloride, which is used for dust abatement on forest roads.

The prescriptions for reducing stream crossing and wildfire risk, and sediment production and delivery are consistent with preventing delivery of inorganic contaminants if any natural sources are present. If the "Required Design Criteria for All Action Alternatives" are applied, then magnesium chloride or calcium chloride, which is often used for dust abatement, would not create water quality concerns. Dust abatement would not be needed under the No Action alternative. Consequently, there will be no direct, indirect, or cumulative effects from inorganic contaminants.

Organic Chemical Contaminants

Water quality can be reduced by contaminants such as industrial solvents and petroleum products. The equipment that would be used for timber harvesting, and road construction, reconstruction, and obliteration uses the largest quantities of these products and pose the greatest risk.

The "Required Design Criteria For All Action Alternatives" would reduce the risk of spilling and delivering these contaminants to the stream network to acceptable levels. Under the No Action alternative, the potential for spilling organic chemical contaminants would not change from the existing conditions, which are at a low level of risk. Consequently, there will be no direct, indirect, or cumulative effects from organic chemical contaminants.

A.3 New Information Following 2004 FEIS and ROD

The Mission Brush Final EIS (FEIS) and Record of Decision (ROD) were released to the public in May 2004 and a legal notice of the decision was published in the newspaper of record (Spokesman Review) on June 1, 2004. The Record of Decision was appealed on July 15, 2004. Following review of the appeal, on August 30, 2004 the Appeal Deciding Officer upheld the decision with the following instruction, "I affirm the Forest Supervisor's decision to implement the Mission Brush project. …However, because of the recent 9th Circuit Opinion in Lands Council vs. Powell, I am directing the Forest to delay implementation of this project until further notice."

Lands Council. v. Powell[1] has further articulated the legal requirements concerning management of National Forest System lands on the Idaho Panhandle National Forests. This Supplemental EIS documents and responds to the new case law, provide the results to the public, and assist the decision-maker in reaching a reasoned and informed decision in light of the new court decision. Discussions in various sections of the SFEIS cover past timber harvests and associated activities in the project's cumulative effects area, the methodologies used for analysis of wildlife and fisheries, soil conditions, and stands of old growth trees. It also discloses changes since the release of the Final EIS and ROD that are pertinent to this project, such as the Regional Forester's October 28, 2004 update to the Northern Region's Sensitive wildlife species listings (changes from the previous list in 1999.)

The following items are included here to provide background and support related discussions located in the body of the SFEIS.

a. Cumulative Effects of Past Harvests and Associated Activities

In their Opinion, the Ninth Circuit Court stated that past timber harvests need to be described in suitable detail (time, place, type and scale) including a sufficiently detailed explanation of the effects of different harvest methods in order to promote an informed assessment by the public and agency personnel. Also, as described in the Vegetation section of Chapter 3 (SFEIS, section 3.3-A), the Council on Enviromental Quality recently clarified the analysis of past actions[2].

The activities and types of effects shown in the following tables provided the basis for the specialist's analyses and interdisciplinary review of these past activities. Please refer to the resource discussions in Chapters 2, 3 and 4 for additional information.

Information for some of the National Forest timber sales is incomplete, in particular for some sales between 1958 and 1985. When the timber stand management information was converted from written records to computer-based data, some pieces of information were unavailable; for example, the name of the sale might not have been listed although the acres and types of treatment and year completed were known. In other instances the database contained the sale name, acres and year of accomplishment, but did not contain the type of treatment. However, missing information can often be ascertained through review of aerial photos and by reviewing conditions on the ground. One piece of evidence in the field is an occasional old stump. The areas containing these old stumps often overlap with acres covered in the list of known timber sales in the far left column. In such instances, it is possible that acres of treatment were counted twice.

The relevance of the incomplete or missing data depends on what is lacking. The name of a particular sale would be of little value in evaluating the environmental effects of the harvest. While knowing the activity code (thinning, sanitation salvage, seed cut, etc.) is beneficial, the same knowledge can be gained through field visits, interpretation of aerial photos, or both. Incomplete or missing information of these types is not relevant to determining significant adverse impacts and the decision-maker's ability to make a reasoned choice among alternatives. It is important to note that past actions are reflected in the current condition of the project area to the extent that they are still affecting the particular resource being analyzed; thus, the effects of past actions are accounted for in the assessment and description of the existing conditions.

The cumulative effects stemming from these activities are explained by resource in Chapter 3 and any important effects are disclosed by resource in Chapter 4. For example, impacts to the Mission Creek watershed from old harvests (1920-30's) are tracked in Chapters 3 and 4 under the Aquatics methodology and analysis sections.

[1] *Lands Council v. Powell* Amended Opinion 395 F.3d 1019 (2005)
[2] CEQ Memorandum to Heads of Federal Agencies regarding Guidance on the Consideration of Past Actions in Cumulative Effects Analysis, June 24, 2005 (see project file document NEPA-44).

Table A-1. Past National Forest Timber Harvest in the Mission Brush Project Area

Sale Name	Year(s)	Even-Aged Harvest	Intermediate Harvest	Total Acres Treated	Location Township, Range, Section(s)	Types of Effects	Description of General Objectives and Effects for Past Activities
Tungsten Mountain	1974	28		28	T65N, R1E SEC. 3,4,9,10	A	**Activity A =** Regeneration harvests that occurred more than 20 years ago. (CC, ST, SW, ISW, and OSR treatments) **Activity B =** Regeneration harvests that occurred less than 20 years ago. (CC, ST, SW, ISW, and OSR treatments) **General objectives** of activities A or B can be to favor development of desired seral species; on private land economics could also be an objective. **Effects of A or B** – generally encourage long-lived seral species (western larch, white pine, ponderosa pine) trending toward historic conditions in the area. **Activity C =** Thinning harvests that occurred more than 20 years ago. (CT treatments) **Activity D =** Thinning harvests that occurred less than 20 years ago. (CT treatments) **General objectives** of activities C or D is to stimulate growth of remaining trees, increase total yield, and utilize trees that are suppressed by crowded conditions. **Effects of C or D** – generally encourage climax species (grand fir, cedar, western hemlock).
Mission Pine	1975		75	75	T65N, R1E SEC 16, 21,22	B	
Round Prairie Hill	1977	7		7 *		A	
Mission Harvey	1977-80	31	220	251	T65N, R1E SEC 9,10,11,14,15,16,21,22	A, C	
Mission 30	1980-81	133	40	173	T65N, R1E SEC 11,13,15,16,21,22	A, C	
Joker	1982		6	6	T65N, R1E SEC 17	C	
Eastport Y	1983-84	82	89	171	T64N, R1E SEC 4,9,16	A, C	
Harvey Mountain	1984-85	33	307	340	T65N, R1E SEC 9,10,15,16,22	B, D	
Prairie View	1985		8	8	T65N, R1E SEC 4	B, D	
Boundary Line	1985-86	6	213	219	T65N, R1E SEC 5, 8,17,21,22	B, D	
Brush Lake	1986	65	23	88	T64N, R1E SEC 9, 16	B, D	
Hall Mountain Salvage	1988		12	12		D	
East Fork Mission 90	1988-89	95	84	179	T65N, R1E SEC 9,10, 16.	B, D	
Hall Brass Salvage	1989		110	110	T65N, R1E SEC 32 T64N, R1E SEC 4	B	
Hall Mountain Pulp	1989	70		70	T65N, R1E SEC 8	B	
West Mission Gillon	1988-89	527	37	564	T65N, R1E SEC 16,21,28,32	B, D	
Mission 160	1989-90	46		46	T65N, R1E SEC 34	B	
Mission Possible	1991		287	287	T65N, R1E SEC 16, 28	D	
Montgomery Mine	1991		40	40	T65N, R1E SEC 30	D	
96 Tiers	1992-93	278	201	479	T65N, R1E SEC 7, 9, 10,15,16	B, D	
Along Hall	1993-95	38	274	312	T65N, R1E SEC 32 T64N, R1E SEC 4, 9	B, D	
Helitier	1994	13	254	267	T65N, R1E SEC 12, 13, 19, 30	B, D	
Wiley Coyote	1996		35	35	T65N, R1E SEC 3,4	D	
Deer Park	1998	9	94	103	T64N, R1E SEC 1, 21	B, D	
EBGB	1996-8		464	464	T65N, R1E SEC 16,21,28	D	
Flory Roundwood	1998		7	7	T64N, R1E, SEC 9	D	
Olson Sawlogs	1998-99		10	10 *	T64N, R1E SEC 28	D	
Alonghaul Salvage	1999		90	90	T65N, R1E SEC 4, 9, 32	D	
Deer Park Blowdown	1999		1	1 *	T64N, R1E SEC 1, 21	D	
Helirockter	1999		100	100	T64N, R1E SEC 27, 28	D	
Rock Bottom	2001		49	49	T64N, R1E SEC 22, 27, 34	D	
Incomplete Information - see above discussions	1958-85	926	933	1,859	Various locations within Assessment Area.	A, C	
TOTAL Acres		**2,387**	**4,152**	**6,539**			

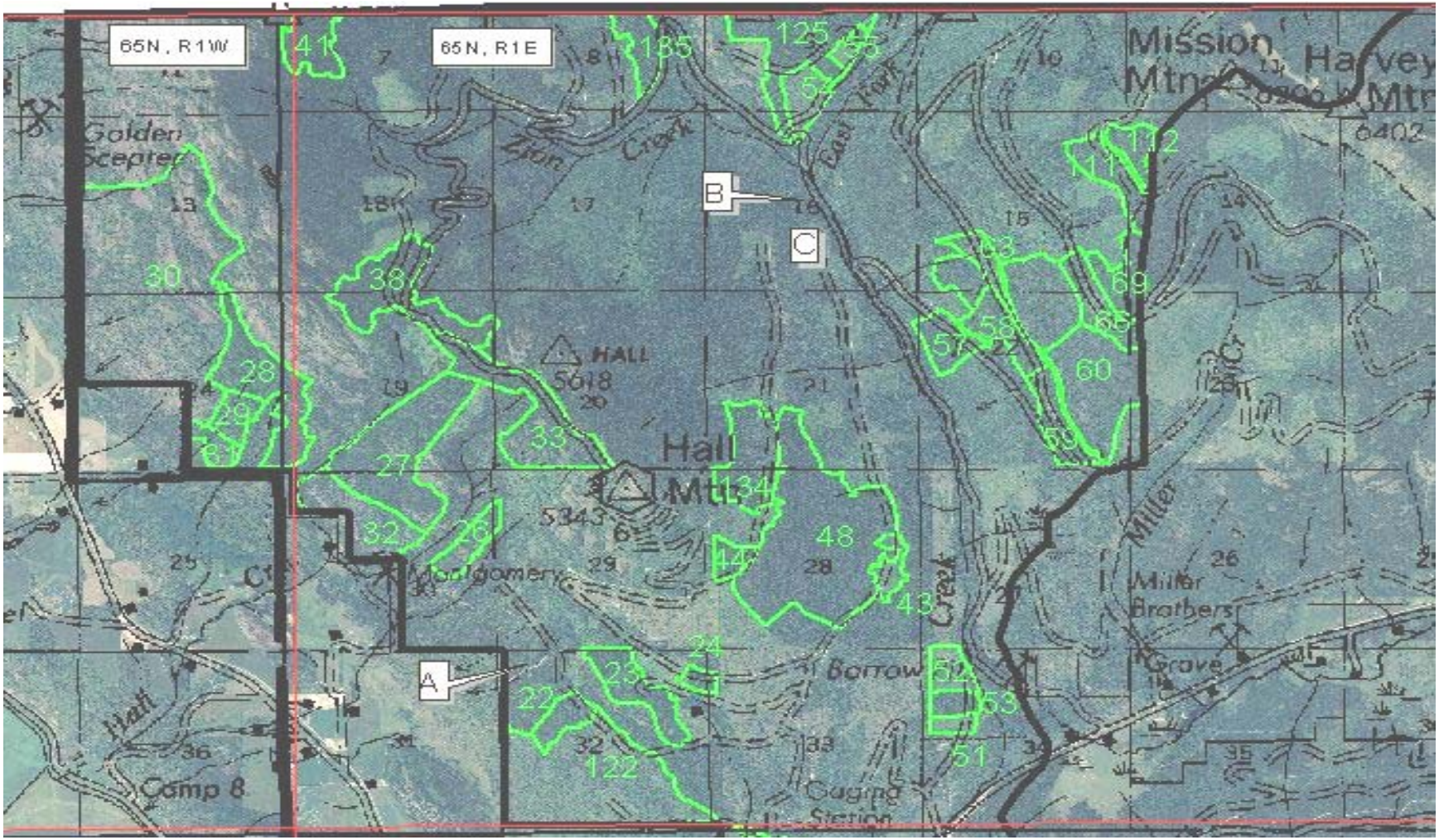

Figure 1. Northern portion of the Mission Brush Project Area

This 2004 photo illustrates the North half of the project area with proposed treatment units overlain in bright green. Label "A" is a mass failure discussed in Chapter 3 Aquatics section. Labels "B" and "C" are the approximate location of stumps and logging flumes (circa 1920-30's) for which there are no records. The cumulative effects of the past present and future activities are discussed in Chapter 3 and 4 aquatics section.

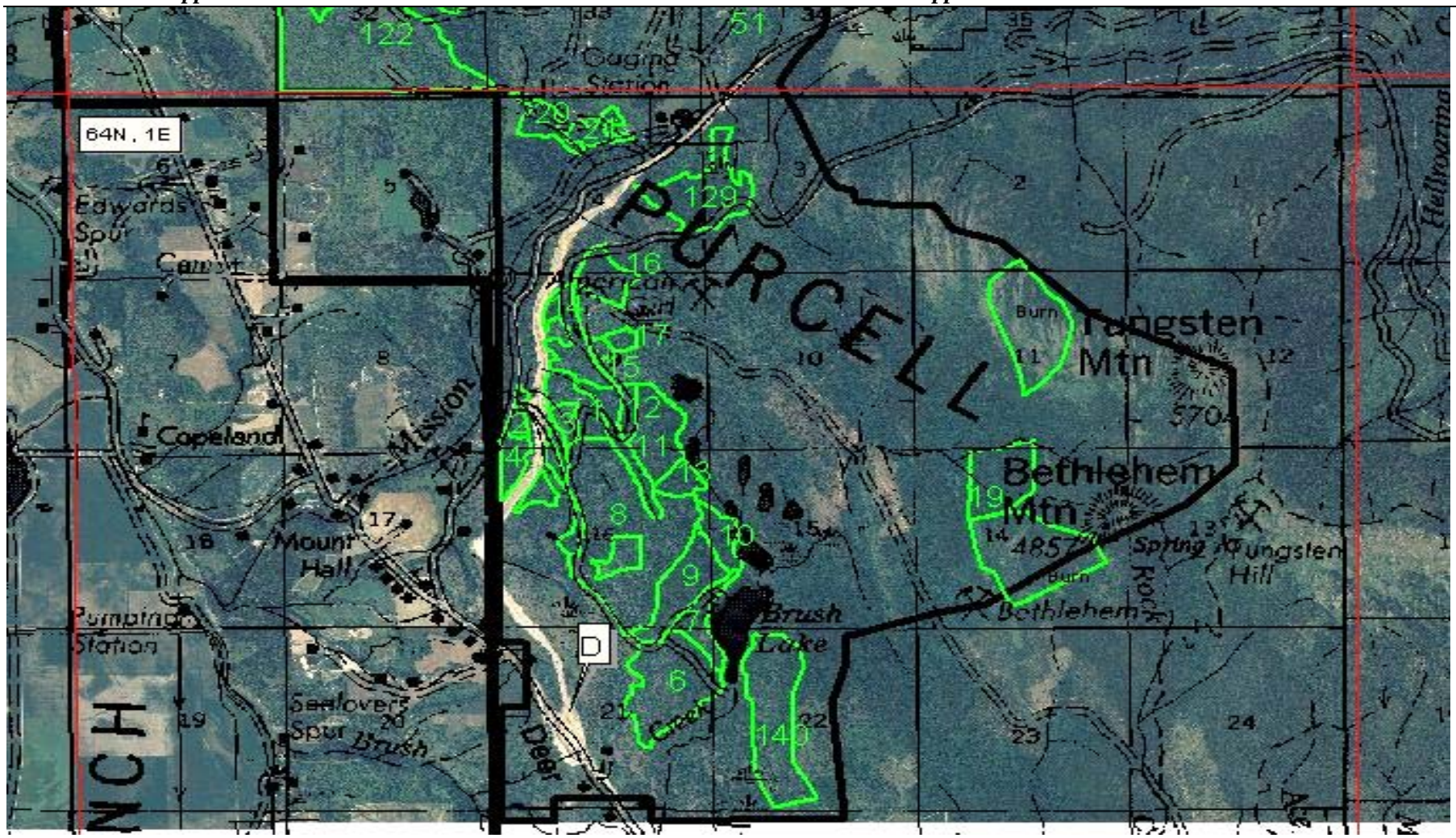

Figure 2. Southern Half of the Mission Brush Project Area

This 2004 photo illustrates the South half of the project area with proposed treatment units overlain in bright green. Label "D" shows the location of the southern point of the realignment of U.S. Highway 95. Since this photo was taken before the new route had been paved, the highway shows up as the light tan narrow curving line running northward from the "D" and joining the existing highway alignment near the letter "P" in the word PURCELL. Evaluated as a reasonably forseeable action in the 2004 FEIS, the highway has since been completed and the SFEIS has been updated to reflect that change in the existing condition.

Assumptions and methods used in gathering private land information: Private landowners have no duty or obligation to report timber harvest activities to the Forest Service. However, aerial photos provide a record of both natural events and land management over time and are an accepted tool in environmental assessment. Data in the following table was developed through aerial photo interpretation and analysis utilizing photos taken in 1958, 1968, 1975, 1983, 1991, 1996; & 2004 satellite images (USDA National Agriculture Imagery Program 2004 Digital Ortho Image Compressed County Mosaic of Boundary County, Idaho, Horizontal Datum of NAD83). Activities were identified, digitized and transferred to a Geographic Information System.

Table A-2. Past Timber Harvest Activities on Private Lands within the Mission Brush assessment area - Sorted by Location and Year

Watershed Description	Location Legal Description	Estimated Acres	Year	Treatment[3]	Logging System	Roads (miles)	Effects	Description of Effects for Past Activities
*Kootenai Valley Bottomlands	T64N-R1E-S19	6	1965	CC	Tractor	none	A	**Activity A =** Regeneration harvests that occurred more than 20 years ago. (CC, ST, SW, ISW, and OSR treatments) **Activity B =** Regeneration harvests that occurred less than 20 years ago. (CC, ST, SW, ISW, and OSR treatments) **Effects of A or B** – generally encourage long-lived seral species (western larch, white pine, ponderosa pine) trending toward historic conditions in the area. General objectives can be to favor development of desired seral species; on private land economics could also be an objective. **Activity C =** Thinning harvests that occurred more than 20 years ago. (CT treatments) **Activity D =** Thinning harvests that occurred less than 20 years ago. (CT treatments) **Effects of C or D** – generally encourage climax species (grand fir, cedar, western hemlock). General objective is to stimulate growth of remaining trees, increase total yield, and utilize trees that are suppressed by crowded conditions.
Total acres in Section 19		6						
Lower Brush Cr	T64N-R1E-S20	16	1950	CC	Tractor	none	A	
Lower Brush Cr	T64N-R1E-S20	2	1965	CC	Tractor	none	A	
Lower Brush Cr	T64N-R1E-S20	3	1973	CT	Tractor	none	A	
Lower Brush Cr	T64N-R1E-S20	3	1982	SW	Tractor	none	A	
Lower Brush Cr	T64N-R1E-S20	5	1995	CC	Tractor	none	A	
Total acres in Section 20		29						
Unnamed tributary to Kootenai River	T64N-R1E-S5	43	1972	SW	Tractor	none	A	
Unnamed tributary to Kootenai River	T64N-R1E-S5	4	1973	CC	Tractor	0.3	A	
Unnamed tributary to Kootenai River	T64N-R1E-S5	22	1987	SW	Tractor	none	B	
Unnamed tributary to Kootenai River	T64N-R1E-S5	43	1993	OSR	Tractor	none	B	
Unnamed tributary to Kootenai River	T64N-R1E-S5	21	1995	ST	Tractor	none	B	
Unnamed tributary to Kootenai River	T64N-R1E-S5	42	2002	ST	Tractor	0.2	B	
Total acres in Section 5		175						
Unnamed tributary to Kootenai River	T64N-R1E-S6	7	1988	CC	Tractor	none	B	
Unnamed tributary to Kootenai River	T64N-R1E-S6	16	1998	CT	Tractor	none	D	
Total acres in Section 6		23						

[3] CC – Clearcut, ST – Seed Tree, CT – Commercial Thin, SW – Shelterwood, ISW- Irregular Shelterwood, OSR – Over Story Removal

* The Kootenai River Valley contains numerous locations of relatively level ground that drains through small, unnamed tributaries or directly to the Kootenai River. They are included under the term *Kootenai Valley Bottomlands.*

Watershed Description	Location Legal Description	Estimated Acres	Year	Treatment[3]	Logging System	Roads (miles)	Effects	Description of Effects for Past Activities
Unnamed tributary – west face Hall	T65N-R1E-S29	62	1974	ST	Tractor	none	A	**Activity A =** Regeneration harvests that occurred more than 20 years ago. (CC, ST, SW, ISW, and OSR treatments) **Activity B =** Regeneration harvests that occurred less than 20 years ago. (CC, ST, SW, ISW, and OSR treatments) **General objectives** can be to favor development of desired seral species; on private land economics could also be an objective. **Effects of A or B** – generally encourage long-lived seral species (western larch, white pine, ponderosa pine) trending toward historic conditions in the area. **Activity C =** Thinning harvests that occurred more than 20 years ago. (CT treatments) **Activity D =** Thinning harvests that occurred less than 20 years ago. (CT treatments) **General objective** is to stimulate growth of remaining trees, increase total yield, and utilize trees that are suppressed by crowded conditions. **Effects of C or D** – generally encourage climax species (grand fir, cedar, western hemlock).
Unnamed tributary – west face Hall	T65N-R1E-S29	9	1975	ST	Tractor	0.2	A	
Unnamed tributary – west face Hall	T65N-R1E-S29	77	1977	CT	Tractor	0.3	C	
Unnamed tributary – west face Hall	T65N-R1E-S29	6	1984	SW	Tractor	0.2	A	
Unnamed tributary – west face Hall	T65N-R1E-S29	29	1989	SW	Skyline	0.4	B	
Unnamed tributary – west face Hall	T65N-R1E-S29	16	2000	CC	Tractor	none	B	
Total acres in Section 29		199						
Unnamed tributary - Upper Hall	T65N-R1E-S30	14	1971	CC	Tractor	none	A	
Unnamed tributary - Upper Hall	T65N-R1E-S30	5	1971	CC	Tractor	none	A	
Total acres in Section 30		19						
Unnamed tributary – west face Hall	T65N-R1E-S31	22	1992	CT	Tractor	none	D	
Unnamed tributary – west face Hall	T65N-R1E-S31	17	1992	CT	Tractor	none	D	
Unnamed tributary – west face Hall	T65N-R1E-S31	21	1993	CT	Tractor	none	D	
Unnamed tributary – west face Hall	T65N-R1E-S31	163	1995	CC	Tractor	none	B	
Unnamed tributary – west face Hall	T65N-R1E-S31	103	1995	ISW	Tractor	none	B	
Total acres in Section 31		326						
*Kootenai Valley Bottomlands	T65N-R1W-S11	16	1974	CT	Tractor	none	C	
*Kootenai Valley Bottomlands	T65N-R1W-S11	21	1974	CT	Tractor	none	C	
*Kootenai Valley Bottomlands	T65N-R1W-S11	10	1995	SW	Tractor	none	B	
*Kootenai Valley Bottomlands	T65N-R1W-S11	10	2000	CT	Tractor	none	D	
Total acres in Section 11		57						**Activity A =** Regeneration harvests that occurred more than 20 years ago. (CC, ST, SW, ISW, and OSR treatments)
*Kootenai Valley Bottomlands	T65N-R1W-S14	30	1988	SW	Tractor	none	B	
Total acres in Section 14		30						

Watershed Description	Location Legal Description	Estimated Acres	Year	Treatment[3]	Logging System	Roads (miles)	Effects	Description of Effects for Past Activities
Unnamed tributary to Kootenai River	T65N-R1W-S23	63	1988	ISW	Tractor	0.5	B	**Activity B =** Regeneration harvests that occurred less than 20 years ago. (CC, ST, SW, ISW, and OSR treatments) **General objectives** can be to favor development of desired seral species; on private land economics could also be an objective. **Effects of A or B** – generally encourage long-lived seral species (western larch, white pine, ponderosa pine) trending toward historic conditions in the area. **Activity C =** Thinning harvests that occurred more than 20 years ago. (CT treatments) **Activity D =** Thinning harvests that occurred less than 20 years ago. (CT treatments) **General objective** is to stimulate growth of remaining trees, increase total yield, and utilize trees that are suppressed by crowded conditions. **Effects of C or D** – generally encourage climax species (grand fir, cedar, western hemlock).
Total acres in Section 23		63						
*Kootenai Valley Bottomlands	T65N-R1W-S25	92	1952	CC	Tractor	none	A	
*Kootenai Valley Bottomlands	T65N-R1W-S25	28	1953	ISW	Tractor	none	A	
*Kootenai Valley Bottomlands	T65N-R1W-S25	56	1963	ST	Tractor	none	A	
*Kootenai Valley Bottomlands	T65N-R1W-S25	19	2001	ST	Tractor	0.3	B	
Total acres in Section 25		195						
Unnamed tributary – Lower Hall	T65N-R1W-S36	7	1975	CC	Tractor	none	A	
Total acres in Section 36		7						
Mission Creek	T64N-R1E-S17	7	1942	CC	Tractor	none	A	
Mission Creek	T64N-R1E-S17	8	1944	CC	Tractor	none	A	
Mission Creek	T64N-R1E-S17	9	1954	CC	Tractor	none	A	
Mission Creek	T64N-R1E-S17	11	1969	CC	Tractor	0.2	A	
Mission Creek	T64N-R1E-S17	4	1970	ISW	Tractor	none	A	
Mission Creek	T64N-R1E-S17	21	1990	ST	Tractor	none	B	
Mission Creek	T64N-R1E-S17	14	1994	CC	Tractor	none	B	**Activity A =** Regeneration harvests that occurred more than 20 years ago. (CC, ST, SW, ISW, and OSR treatments) **Activity B =** Regeneration harvests that occurred less than 20 years ago. (CC, ST, SW, ISW, and OSR treatments) **General objectives** can be to favor development of desired seral species; on private land economics could also be an objective.
Mission Creek	T64N-R1E-S17	18	1994	ISW	Tractor	none	B	
Mission Creek	T64N-R1E-S17	19	1998	ST	Tractor	none	B	
Mission Creek	T64N-R1E-S17	20	2003	CC	Tractor	0.5	B	
Total acres in Section 17		131						
Mission Creek	T64N-R1E-S18	13	1995	CT	Tractor	none	D	
Mission Creek	T64N-R1E-S18	13	2001	ST	Tractor	none	B	
Total acres in Section 18		26						
Mission Creek	T64N-R1E-S20	4	1953	CC	Tractor	0.2	A	
Mission Creek	T64N-R1E-S20	3	1960	CC	Tractor	none	A	
Mission Creek	T64N-R1E-S20	1	1960	CC	Tractor	none	A	

Watershed Description	Location Legal Description	Estimated Acres	Year	Treatment[3]	Logging System	Roads (miles)	Effects	Description of Effects for Past Activities
Mission Creek	T64N-R1E-S20	29	1999	SW	Tractor	none	B	**Effects of A or B** – generally encourage long-lived seral species (western larch, white pine, ponderosa pine) trending toward historic conditions in the area. **Activity C =** Thinning harvests that occurred more than 20 years ago. (CT treatments) **Activity D =** Thinning harvests that occurred less than 20 years ago. (CT treatments) **General objective** is to stimulate growth of remaining trees, increase total yield, and utilize trees that are suppressed by crowded conditions. **Effects of C or D** – generally encourage climax species (grand fir, cedar, western hemlock).
Total acres in Section 20		37						
Mission Creek	T64N-R1E-S5	40	1987	SW	Tractor	none	B	
Mission Creek	T64N-R1E-S5	323	1989	ISW	Tractor	0.7	B	
Total acres in Section 5		363						
Mission Creek	T64N-R1E-S8	11	1942	CC	Tractor	none	A	
Mission Creek	T64N-R1E-S8	117	1952	CC/Res	Tractor	0.5	A	
Mission Creek	T64N-R1E-S8	2	1971	CC	Tractor	0.1	A	
Mission Creek	T64N-R1E-S8	13	1994	SW	Tractor	none	B	
Mission Creek	T64N-R1E-S8	12	1994	ISW	Tractor	none	B	
Mission Creek	T64N-R1E-S8	11	1995	CT	Skyline	none	D	
Mission Creek	T64N-R1E-S8	11	1999	CC	Tractor	none	B	
Mission Creek	T64N-R1E-S8	11	1999	CC	Tractor	none	B	
Total acres in Section 8		188						
Mission Creek	T65N-R1E-S27	7	1973	CC	Tractor	none	A	
Mission Creek	T65N-R1E-S27	71	1974	CT	Tractor	none	C	
Mission Creek	T65N-R1E-S27	161	1975	CT	Tractor	1.0	C	
Mission Creek	T65N-R1E-S27	19	1977	CT	Tractor	none	C	
Mission Creek	T65N-R1E-S27	28	1977	CT	Tractor	none	C	
Mission Creek	T65N-R1E-S27	35	1977	CT	Tractor	none	C	
Mission Creek	T65N-R1E-S27	7	1990	CC	Tractor	none	B	
Mission Creek	T65N-R1E-S27	71	1996	CC	Tractor	none	B	
Mission Creek	T65N-R1E-S27	35	1996	CC	Tractor	none	B	
Mission Creek	T65N-R1E-S27	29	2000	ST	Tractor	none	B	
Mission Creek	T65N-R1E-S27	33	2000	ST	Tractor	none	B	**Activity A =** Regeneration harvests that occurred more than 20 years ago. (CC, ST, SW, ISW, and OSR treatments) **Activity B =** Regeneration harvests that occurred less than 20 years ago. (CC, ST, SW, ISW, and OSR treatments)
Total acres in Section 27		496						
Mission Creek	T65N-R1E-S29	82	1974	ST	Tractor	4.0	A	
Mission Creek	T65N-R1E-S29	43	1977	SW	Tractor	none	A	
Mission Creek	T65N-R1E-S29	38	1980	ST	Skyline	0.1	A	
Mission Creek	T65N-R1E-S29	77	1990	CT	Tractor	none	D	
Mission Creek	T65N-R1E-S29	9	1995	ST	Tractor	0.2	B	
Mission Creek	T65N-R1E-S29	77	2000	ST	Tractor	none	B	

Watershed Description	Location Legal Description	Estimated Acres	Year	Treatment[3]	Logging System	Roads (miles)	Effects	Description of Effects for Past Activities
Total acres in Section 29		326						**General objectives** can be to favor development of desired seral species; on private land economics could also be an objective. **Effects of A or B** – generally encourage long-lived seral species (western larch, white pine, ponderosa pine) trending toward historic conditions in the area. **Activity C =** Thinning harvests that occurred more than 20 years ago. (CT treatments) **Activity D =** Thinning harvests that occurred less than 20 years ago. (CT treatments) **General objective** is to stimulate growth of remaining trees, increase total yield, and utilize trees that are suppressed by crowded conditions. **Effects of C or D** – generally encourage climax species (grand fir, cedar, western hemlock). .
Mission Creek	T65N-R1E-S33	116	1973	CT	Tractor	1.3	C	
Mission Creek	T65N-R1E-S33	101	1973	CT	Tractor	0.7	C	
Mission Creek	T65N-R1E-S33	126	1973	CT	Tractor	none	C	
Mission Creek	T65N-R1E-S33	268	1973	CT	Tractor	3.7	C	
Mission Creek	T65N-R1E-S33	22	1997	SW	Tractor	none	B	
Mission Creek	T65N-R1E-S33	116	1999	ST	Tractor	none	B	
Mission Creek	T65N-R1E-S33	101	1999	ST	Tractor	none	B	
Mission Creek	T65N-R1E-S33	16	2001	CC	Tractor	none	B	
Total acres in Section 33		866						
Mission Creek	T65N-R1E-S34	20	1988	CT	Tractor	none	D	
Total acres in Section 34		20						

CC – Clearcut, ST – Seed Tree, CT – Commercial Thin, SW – Shelterwood, ISW- Irregular Shelterwood, OSR – Over Story Removal

* The Kootenai River Valley contains numerous locations of relatively level ground that drains through small, unnamed tributaries or directly to the Kootenai River. They are included under the term *Kootenai Valley Bottomlands.*

A.4 Soil Resources

a. Introduction

Soil is the unconsolidated mineral or organic material on the immediate surface of the earth that serves as the natural medium for the growth of land plants. A productive soil can sustain biological productivity, maintain environmental quality, and promote plant and animal health. The purpose of this report is to investigate and disclose the potential of effects of the proposed action on the soil resource.

b. Regulatory Framework

The regulatory framework providing direction for protecting a site's inherent capacity to grow vegetation comes from the following principal sources:

- Multiple Use-Sustained Yield Act of 1960
- National Forest Management Act of 1976 (NFMA)
- Code of Federal Regulations for Forest Planning (36 CFR 219.6)
- Forest Plan and Regional Soil Quality Standards (2554.03 – R1 Sup. 2500-99-1)

The Multiple Use-Sustained Yield Act of 1960 directs the Forest Service to achieve and maintain outputs of various renewable resources in perpetuity without permanent impairment of the land's productivity. Section 6 of the NFMA charges the Secretary of Agriculture with ensuring research and continuous monitoring of each management system to safeguard the land's productivity. The Code of Federal Regulations for Forest Planning requires the Forest Service to determine the effects of various management activities on land productivity (36 CFR Part 219, Section 6, 2005).

To comply with requirements, the Chief of the Forest Service charged each Forest Service Region to develop soil quality standards for detecting soil disturbances indicating a loss in long-term productive potential. These standards and guidelines are built into Forest Plans. In an effort to imply the most stringent standard, both Forest Plan and Regional Standards were incorporated into the analysis of the project. Management direction in the Forest Plan (p. II-17) is to manage the soil resource to maintain long-term productivity. Forest Plan objectives and standards (pp. II-32 and 33) include:

- Management activities on Forest lands will not significantly impair the long-term productivity of the soil or produce unacceptable levels of sedimentation resulting from soil erosion. This will be accomplished using technical guidelines developed in conjunction with the soil survey and Best Management Practices necessary to protect soil productivity and minimize sedimentation.
- Soil-disturbing management practices will strive to maintain at least 80 percent of the activity area in a condition of acceptable productivity potential for trees and other managed vegetation. Unacceptable productivity potential exists when soil has been detrimentally compacted, displaced, puddled, or severely burned as determined in the project analysis.
- Projects should strive to maintain sufficient large woody debris to maintain site productivity.
- In the event of whole-tree yarding, provisions for maintenance of sufficient nutrient capital should be made in the project analysis.

The Regional Soil Quality Standards (R-1 Supplement 2500-99-1) were revised in November 1999. Manual direction recommends maintaining 85% of an activity area's soils at an acceptable productivity potential with respect to detrimental impacts, including the effects of compaction, displacement, rutting, severe burning, surface erosion, loss of surface organic matter, and soil mass movement. This recommendation is based on research indicating that a decline in productivity would have to be at least 15% to be detectable (Powers, 1990). In areas where more than 15 percent detrimental soil conditions exists from prior activities, the cumulative detrimental effects from project implementation and restoration should not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality. These standards do not apply to intensively developed sites such as permanent roads, mines, developed recreation and administrative sites.

c. Methodology

Analysis Area

The analysis area for soil resources encompasses all land within an individual treatment unit or a compilation of all the individual harvest units and associated temporary roads. The analysis area for soil resources was broken down into activity areas based on proposed vegetation treatments, logging systems, and fuel treatments (Table A-7). The effects of temporary roads (Table A-9) were considered in the activity area in which they were proposed.

Soils outside the unit boundaries are not expected to be directly or indirectly affected by this proposal since no harvest or post-harvest equipment will operate off system roads outside the unit boundaries. The approximately 17,918 acre project area forms the boundary for the cumulative effects analysis of soils. Existing classified National Forest system roads are considered designated lands and, as such, the loss of soil productivity due to their construction will not be considered in the cumulative effects analysis.

Analysis Methods

Soil resource existing conditions were determined using TSMRS records, published literature, aerial photography, and GIS data. Landtype descriptions and hazard ratings were gathered from landtype descriptions and characteristics described in the Idaho Panhandle National Forests Land Systems Inventory (USDA Forest Service 1999) and were field verified in the project area during numerous visits by the District personnel. Field documentation is included in the Soils section of the project file.

Existing conditions and impacts from past activities were quantified using on-the-ground soil transects (the "Onsite Assessment Method" outlined in Niehoff (2002) and visual field observations. Soil resource proposed harvest activity impacts were evaluated using the Soil Disturbance Spreadsheet model (hereafter referred to as the spreadsheet model; see project file).

The spreadsheet model evaluates the impacts of proposed activities on harvest units for each harvest method based on empirically derived coefficients that were obtained and averaged from numerous monitored sites throughout the IPNF (Niehoff 2002). The model is limited to the harvest and slash disposal methods for which coefficients have been determined, and its coefficients assume that the appropriate best management practices (BMPs) will be implemented. The model does not account for changes in soil type or the recovery of soils over time. The protocol for applying the Soil Disturbance Model is included in the "Soil NEPA Analysis Process and Source of Soil Disturbance Model Coefficients" (Niehoff 2002).

d. Affected Environment

Geology and Landscape

The project area encompasses approximately 17,918 acres of Federal and private land between approximately 2400 to 5600 feet on generally west- and south-facing slopes of previously glaciated terrain in the Hall Mountain, Mission Mountain, and Brush Lake areas (see Chapter 1, Figure 1-2 *Mission Brush Project Area*). The parent geology is dominated by the metasedimentary Precambrian Belt Supergroup, mafic intrusive rocks, Cretaceous medium- to coarse-grained granodiorite, and various glacial or alluvial deposits (Miller et al. 1999; project file Soil Resource Report, Map 1).

The area was visited by at least two ice advances over the past 50,000 years that covered all but the tops of the highest mountains in north Idaho. As the ice sheets moved over the mountains, material was scoured in some areas and deposited and compacted as tills in others, reshaping the landscape through the rounding of ridges and widening of valleys.

The valley bottoms are defined by low to mid elevation, narrow valley bottoms surrounded by mountain toe slopes and generally gently to moderately steep glaciated mountain side slopes. Occasional gently sloping benches are typical of a glaciated mountainous landscape while steep terrain can be found near Hall and Mission Mountain. Bare rock outcrop is common along ridges and frequently occurs in conjunction with drier habitat types.

Soils are generally dark yellowish brown, often skeletal (rocky), and form in volcanic ash influenced loess overlying glacial till, metasedimentary, or granitic bedrock sources. Texture and rock fragment content is extremely variable.

Low-to mid-elevation glaciated mountain slopes, benches, and draws often contain deeper (8 to 25 inches deep) ash-influenced dark yellow to brown soils of silt loam to sandy silt loam texture and 5 to 80 percent rock fragments that support mixed

coniferous forest. Gravel and rock fragment content varies and increases in amount and size depending on shallowness or depth to bedrock.

Soils in valley bottoms are usually poorly developed with little or no volcanic ash surface layers. They support a complex association of vegetation generally dominated by riparian and moist habitat types. Upland areas can contain volcanic ash-influenced soil of silt-loam texture overlying alluvium, till, or bedrock and can be quite variable.

A restrictive layer of dense till often occurs at a depth of 12 to 60 inches and may inhibit infiltration or water movement, especially on the northern portion of the project area around Zion Creek and the near Harvey Mountain. When associated with roads, these compacted layers require frequent cross draining.

Soils and Productivity

The most productive part of the soil occurs near the surface at the contact between the forest litter and the mineral soil. Here, the litter has been highly decomposed into dark colored amorphous material, which is the richest part of the soil. This layer is frequently only a few inches thick, but its presence is much more important than its thickness would indicate. This organic-matter-rich layer contains most of the soil nitrogen, potassium, additional nutrients, and mycorrhizae, which must be present for a site to be productive.

Underneath this organic horizon is volcanic ash, which occurs as the surface layer of the mineral soil. The volcanic materials are derived from several of the Cascade volcanoes with most of the ash originating from Mt. Mazama (Crater Lake) in Oregon about 6,700 years ago. The top part of the ash is usually enriched with organic matter that is incorporated into this part of the soil. The ash has a high water- and nutrient-holding capacity, both of which are important for soil productivity, while the lower part of the volcanic ash contains less organic matter and is not as fertile.

Below the volcanic ash, the subsoils and substratum tend to be medium to coarse textured in the granitic glacial tills. These young glacial soils are very weakly weathered and generally have a high component of rock fragments, although this can be quite variable, particularly in the alluvial bottoms. Granitic soils are rated as having good inherent nutrient status, but medium to low soil nutrient content because of their poor water retention capacity.

Retaining coarse woody debris (CWD) and organic matter is important in maintaining the soil's most productive layer. CWD is defined as woody material derived from tree limbs, boles, and roots greater than three inches in diameter and in various stages of decay. It performs many physical, chemical, and biological functions in forested ecosystems and is also a key habitat component for many wildlife species and for stream ecology (Graham 1994). Coarse woody debris in natural systems fluctuates with forest growth, mortality, fire, and decay.

Because CWD is such a valuable part of a functioning ecosystem, a portion of the material needs to be maintained to ensure that organic matter is recycled for long-term productivity. If not considered in planning, harvest and slash burning can remove large wood to such a degree that its soil function is impaired since both standing boles and down wood may be much reduced.

The volcanic ash surface layers are very productive but highly susceptible to compaction, displacement, and surface erosion, especially under wet conditions. Long-term damage to productivity from burning may also occur if soil moistures are not sufficient to protect soil organisms (Borchers and Perry 1990; Hungerford et al. 1991; Niehoff 1985).

The presence of noxious weeds can alter vegetative cover and soil stability and effectively reduces the diversity of native plant species without providing comparable effective soil cover. This can lead to an increase in potential soil erosion, decrease in organic matter input into to the soil, and reduction in potential soil productivity.

Loss of Nutrients

Harvest results in the removal of nutrients that have been accumulated in the wood over time. Of increased concern is the role of potassium in forest health, especially susceptibility to insects and disease (Garrison-Johnston et al. 2003). Research (Garrison-Johnston et al. 2004; Shen et al. 2001) suggests a complex balance between underlying geology and the natural deficiency of potassium in northern Idaho. In comparison, soil nitrogen can be replenished more rapidly through nitrogen fixation or atmospheric deposition than can potassium, which mostly weathers from rocks.

Whole-tree yarding and removal of treetops can lead to the direct loss of potassium (Morris and Miller 1994). On some sites, 45 percent of the available potassium is detained in trees, with the remainder being held in subordinate vegetation, forest floor,

and soil pools. Within the trees, about 85 percent of the potassium is held in the branches, twigs, and foliage (Garrison and Moore 1998). It is therefore vital to recycle as many nutrients as possible before slash removal which can be done by over wintering small-scale debris to leach out potassium (Baker et al. 1989; Barber and Van Lear 1984; Edmonds 1987; Garrison and Moore, 1998; Laskowski et al. 1995 and Palviainen et al. 2003).

Under most natural circumstances, potassium returns to the soil when the tree dies. Unlike many other soil nutrients, potassium is derived primarily from underlying geologic formations and is a product of slow weathering processes. Some geological formations of the metasedimentary Precambrian Belt Supergroup have a natural deficiency of potassium. In contrast, the granitic rocks present in the southwestern portion of the project area are not expected to be as low in potassium as Belt rocks (Garrison-Johnston 2004) but exhibit moderate to low soil nutrient status because of their poor ability for nutrient retention. The majority of proposed activity areas are on metasedimentary Belt rocks of the Pritchard formation (47 percent), glacial alluvial material (25 percent), mafic intrusions (14 percent), and granitic rocks (14 percent).

The IFTNC continues to research potassium contents within tree species and different rock types in order to establish specific minimum thresholds for retention and effects of potassium on tree growth and resistance to root diseases (Mika 2005; Shaw 2005). Until these minimum thresholds are developed through research, the Idaho Panhandle National Forests are using management recommendations from the IFTNC (Garrison and Moore 1998) as a guideline for maintaining sufficient potassium on a site. These measures have been incorporated into the design and mitigation measures for soils.

e. Existing Conditions

Three criteria were used to assess existing conditions for soil resources:

1. **Landtypes and hazard ratings** of the Idaho Panhandle National Forest;
2. **Soils and productivity**;
3. **Site conditions** in the activity area in which proposed activities would occur.

Land Types and Hazard Ratings

Forty land types have been identified and mapped in the project area out of which a maximum of 27 (Alt. 2) intersect with proposed activity units (project file Soil Resources Report, Figure 2). Detailed descriptions of each landtype and the hazard ratings have also been compiled and are broken into subcategories of mass failure, productivity, surface erosion, and sediment delivery potential (project file Soil Resources Report, Figures 3 to 6); each is rated as low, moderate, or high for a particular land type – Table A.3 displays information for landtype mass failure potential ratings; Table A-4 displays information for landtype productivity potential ratings; Table A-5 displays information for landtype surface erosion potential.

Mass Failure Potential - the relative probability of downslope movement of masses of soil material. Besides natural failure, landslides or slumping can be triggered by a number of mechanisms, including harvest activities and related road building.

In the project area, 87 percent of soils have a low, 9 percent have a moderate, and 4 percent have a high mass failure potential (project file Soil Resources Report, Figure 3). The majority of landtypes classified as high are associated with moderately to deeply incised draws on side slopes on the western facing slopes of Hall Mountain.

In the activity units, all but two landtypes exhibit low (75 to 80 percent) or moderate (19 to 24 percent) mass failure potential (see the following table). The one percent (approximately 38 acres) of potentially high mass failures are located within landtype MU121 near the toe slopes of Unit 122 and landtype MU265 crossing the boundaries of activity units 27 and 32 on Hall Mountain.

Table A-3. Percentage of landtypes with low, moderate, and high mass failure potential ratings in the proposed activity areas.

Rating	Percent in		
	Alternative 2	Alternative 3	Alternative 4
Low	80	77	75
Moderate	19	22	24
High	1	1	1

Removal of forest canopy and cover, from either clearcutting or wildland fire, increases landslide occurrence (Megahan et al. 1978, Gray and Megahan 1981). This is primarily due to root decay, soil disturbance, increased snow accumulation and altered melting rates, and soil water increases from reduced interception and transpiration.

Megahan et al. (1978) found that landslide occurrence increased only slightly when overstory canopy was reduced from 100 percent to 11 percent, but increased dramatically when canopy closure went below 11 percent. They also found that crown cover from shrubs affected landslide occurrence after 80 percent crown removal and indicated that landslide occurrence is more sensitive to shrub removal than tree crown removal.

Also refer to the Aquatics section of the SFEIS for additional discussion and evaluation of mass failure potential and the LISA model that quantifies landtype stability.

Productivity Potential is a rating of the relative capacity or ability of a soil to produce and sustain biomass.

In the project area, 28 percent of soils were rated as having low to moderately low productivity potential and 72 percent as having moderate to moderately high productivity potential (project file Soil Resources Report, Figure 4).

In the activity units, approximately 33 to 34 percent of soils were rated as having low, and 66 to 67 percent as having a moderate to moderately high productivity potential (project file Soil Resources Report, Table 2). The majority of landtypes classified as low are associated with the west-facing slopes and ridges along Hall Mountain, shallow soils associated with rock outcrops near Brush Lake, and portions of the ecosystem burn units near Bethlehem Mountain.

Table A-4. Percentage of landtypes with low to moderate and moderate to high productivity potential ratings in the proposed activity areas.

Rating	Percent in		
	Alternative 2	Alternative 3	Alternative 4
Low to Moderate	34	33	34
Moderate to high	66	67	66

Soils susceptible to reduced productivity potential are generally those located on shallow, rocky, steep slopes on southerly aspects. Removal of canopy can affect soil moisture content in several ways. Precipitation may enter previously intercepted areas and provide existing or establishing vegetation with additional needed moisture and increase decomposition rates. Conversely, rain events may increase erosion on the now exposed soil, especially if the potential is high, and reduce the availability of a growing medium. Furthermore, increased sunlight may also support plant growth or heat up soils to the extent that vegetation is inhibited.

Surface Erosion Potential is a rating of the relative susceptibility of exposed soils to sheet and rill erosion.

In the project area, 86 percent of soils were rated as exhibiting low surface erosion potential and 14 percent were rated as moderate (project file Soil Resources Report, Figure 5).

In the activity units, ~73 to 79 percent of the landtypes exhibit low surface erosion potential with the remaining 21 to 27 percent having a moderate rating (see following table).

Table A-5. Percentage of landtypes with low, moderate, and high surface erosion potential ratings in the proposed activity areas.

Rating	Percent in		
	Alternative 2	Alternative 3	Alternative 4
Low	79	77	73
Moderate	21	23	27
High	0	0	0

Roads are currently the primary source of erosion and sediment production in the project area. The dominant processes in roaded portions are surface erosion from bare soil areas of roads, including the cut slope, fill slope, and travelway. Revegetation of cut slopes and fill slopes are often difficult because of lack of soil moisture, organic material, low productivity potential, and desiccation of seeds and seedlings, especially on south-facing slopes. On moist slopes, revegetation efforts are often more successful due to reduced stress and since erosion of road cut slopes and fill slopes is generally lower.

Road erosion and sediment yield usually decline after construction (Jones 2000; Switalski et al. 2004) but can provide a chronic, long-term source of sediment to streams within the project area. Periodic large pulses of erosion may occur during intense water yield and overland flow events in interaction with road drainage systems.

Refer to the Aquatics section of the S FEIS for additional discussion and evaluation of erosion and road issues.

Sediment Delivery Potential is a rating of the probability of eroded soil reaching a stream channel. By using slope gradient, slope shape, and distance to channel, a rating of low, moderate, or high potential is determined.

In the project area, 79 percent of the soils were rated as exhibiting low sediment delivery potential, 11 percent were rated as moderate, and 10 percent were rated as high (project file Soil Resources Report, Figure 6).

In the activity units, ~77 to 92 percent of landtypes exhibit low sediment delivery potential and moderate ratings occur on ~5 to 17 percent (see the following table). High ratings are present on 3 percent of landtypes and are primarily associated with shallowly to deeply incised draws on Hall Mountain and around Bethlehem Mountain as well as side slopes above and below FR2481 passing through units 59 and 60 in the Mission Creek drainage.

Table A-6. Percentage of landtypes with low, moderate, and high sediment delivery potential ratings in the proposed activity areas.

Rating	Percent in		
	Alternative 2	Alternative 3	Alternative 4
Low	79	77	79
Moderate	20	22	17
High	1	1	3

Refer to the Aquatics section of the SFEIS for additional discussion and evaluation of sediment delivery potential.

Soils and Productivity

The soils found in the Mission Brush project area owe their productivity to excellent nutrient-holding capacities and other favorable characteristics provided by an ash-influenced layer that can extend to over two feet deep in certain locations. However, these generally young and poorly developed soils can experience long-term deficiencies when insufficient biologically essential elements, such as organic matter and coarse woody debris, are not available.

Organic matter content varies throughout the project area and appears to be optimum or low on the west-and south-facing and high on the north-facing slopes. Its variability and depth is natural and usually correlates to habitat type and aspect with excessive needle cast often decreasing the establishment of a more herbaceous ground cover. Exclusion of fire has also contributed to increased duff accumulations.

Coarse woody debris is variable as well with some stands containing high amounts of downed wood, especially those that have never been harvested and have been excluded from wildfire for a long period of time. Decomposition may also be affected due to light and moisture variations under different canopy densities. Whole-tree yarding and removal of treetops can also remove nutrients, woody material, and lead to the direct loss of potassium (Morris and Miller 1994).

Site Conditions

Detrimental Soil Impacts are defined as the proportion of an activity area that may be subjected to compaction, displacement, rutting, surface erosion, soil mass movement, or severe burning. These impacts are due to a particular management activity, such as timber harvest, fuels treatment, or prescribed burning, exclusive of committed resources such as system roads.

Soil physical, chemical, and biological properties can be detrimentally impacted by management activities or natural events.

- **Soil physical properties** would be most affected by temporary road construction, use of ground-based logging, and site preparation systems (Page-Dumroese 1993). Alteration of soil physical properties can result in loss of soil capacity to sustain native plant communities and reductions in storage and transmission of soil moisture that may affect water yield and stream sediment regimes. Effects can be long lasting and impacted areas may become less productive and more favorable for weed invasion. Surface soil loss from roads through displacement and mixing with infertile substrata also has long lasting consequences for soil productivity because of the superiority of the volcanic ash surface layer over subsoils and substrata.

- **Soil chemical properties** would be most affected by activities that result in excessive loss or redistribution of nutrients. This is likely to occur where rotations are short, whole tree yarding removes green tops and branches, heavy machine piling and burning concentrates slash in few large piles, or where hot broadcast burns sterilize soils. Alteration of soil chemical properties can also result in loss of soil capacity to sustain native plant communities and support natural levels of tree growth and resistance to pathogens (Garrison and Moore, 1998).

- **Soil biological properties** would be most affected by activities that result in high levels of loss or redistribution of existing and recruitable fine and coarse woody debris (snags and green trees). This could also include loss of substrate for micro- and macroinvertebrates, bacteria, and fungi that are essential for decomposition and soil productivity (Jurgensen et al. 1997).

The soils in an activity area are considered detrimentally disturbed when the following conditions are present as a result of Forest practices (from R1 – Supplement 2500-99-1):

- Detrimental compaction results in a 15 percent or more increase in bulk density. Soil compaction reduces the supply of air, water, and nutrients to plants. Roading, ground-based yarding, and dozer piling are the major contributors to compaction.
- Detrimental displacement is the removal of one or more inches (in depth) of any surface soil horizon, usually the A horizon, from a continuous area greater than 100 square feet.
- Rutting consists of wheel ruts at least 2 inches deep in wet soils.
- Surface erosion is indicated by rills, gullies, pedestals, and soil deposition and should be kept within tolerable limits by retaining the enough ground cover, depending on site characteristics.
- Severe fire consumes most woody debris and the entire duff and litter layer, exposing mineral soil and creating very high temperatures at the soil surface when surface soil moisture content is low. Many of the nutrients stored in these organics can also be volatilized and removed from the site in fly-ash (Amaranthus 1989; DeBano 1991; Garrison and Moore 1998).

Initial evaluation of proposed harvest activities used TSMRS (Timber Stand Management Record System). During the fall of 2003, the "Onsite Assessment Method" (Niehoff 2002) was conducted to evaluate past harvest impacts on proposed activity areas in Mission Brush project area. Results of existing conditions are outlined in Table 5 (detailed field notes are located in the project file – soils section).

The units proposed for initial entry (no existing disturbance) were not transected but were visited by the forester and included walk throughs and visual observations of impending hazards, especially associated with potential mid-slope roads. Site specific recommendations were made where considered necessary and are available in the project file and incorporated into "Features designed to protect soils and site productivity" in Chapter 2. Field verification found that past harvest activities on Unit 16 exceed detrimental disturbance limits of 15% (Table 5) with all measured disturbances being directly related to rutting, existing roads, or skid trails (mitigation measures and considerations are discussed under Environmental Consequences).

Table A-7. Existing conditions and potential impacts following guidelines in Niehoff (2002).

					Potential Detrimental Disturbance*							
					ALT 1 (No Action)		**ALT 2** (Proposed Action)		**ALT 3** (No Temp Roads or Girdling)		**ALT 4** (Fewer Units than in Alt 2)	
Unit	**Acres**	**Harvest System#**	**Site Prep**	**% Detr. Dist. Soil** (Existing Condition)	**% of Activity Area** (above existing)	**Acres of Activity Area**	**% of Activity Area**	**Acres of Activity Area**	**% of Activity Area**	**Acres of Activity Area**	**% of Activity Area**	**Acres of Activity Area**
1	37	**T**	GP	8	0	0	10	4	N/A	N/A	10	4
2	12	**T**	GP	7	0	0	10	1	N/A	N/A	10	1
3	9	**S**	GP	0	0	0	5	1	N/A	N/A	5	1
4	52	**T**	GP	4	0	0	10	5	N/A	N/A	10	5
6	114	**T/S**	GP/UB	3	0	0	9	10	9	10	9	10
7	34	**T**	GP/UB	6	0	0	10	3	10	3	10	3
8	232	**T/S**	GP/UB	9	0	0	11	26	11	26	11	26
9	67	**T**	GP/UB	5	0	0	10	7	N/A	N/A	10	7
10	28	**T**	GP	4	0	0	10	3	N/A	N/A	10	3
11	61	**T**	GP	3	0	0	10	6	N/A	N/A	10	6
12	14	**S**	GP	0	0	0	5	1	N/A	N/A	5	1
13	20	**T**	GP/UB	6	0	0	10	2	10	2	10	2
14	51	**T/S**	GP	10	0	0	6	3	6	3	6	3
15	6	**T**	UB	0	0	0	10	1	N/A	N/A	10	1
16	34	**T/S**	GP/UB	16	0	0	16	5	N/A	N/A	16	5
17	9	T	UB	11	0	0	10	1	N/A	N/A	10	1
19	67	**T**	GP/UB	0	0	0	10	7	N/A	N/A	10	7
20	26	T	GP	12	0	0	13	3	13	3	13	3
21	20	GIRD	N/A	N/A	0	0	0	0	N/A	N/A	0	0
22	30	S	UB	3	0	0	2	1	2	1	2	1
23	63	T	GP	2	0	0	13	8	13	8	13	8
24	12	S	GP/UB	0	0	0	5	1	5	1	5	1
26	34	H^+	UB	1	0	0	2	1	2	1	2	1
27	176	H^+	UB	9	0	0	9	16	9	16	9	16
28	115	H^+	UB	3	0	0	3	3	3	3	3	3
29	29	H^+	UB	2	0	0	2	1	2	1	2	1
30	507	H^+	UB	4	0	0	4	20	4	20	4	20
31	22	H^+	UB	1	0	0	2	0	2	0	2	0
32	83	H^+	GP/UB	2	0	0	5	4	5	4	5	4
33	125	S	UB	0	0	0	2	3	2	3	N/A	N/A
38	115	**T**	GP/UB	2	0	0	10	12	10	12	N/A	N/A
41	49	H	GP/UB	0	0	0	2	2	N/A	N/A	N/A	N/A
43	23	GIRD	N/A	N/A	0	0	0	0	N/A	N/A	0	0
44	20	T	GP/UB	2	0	0	13	3	13	3	N/A	N/A
48	324	T/S	GP	8	0	0	11	36	11	36	11	36
51	13	GIRD	N/A	N/A	0	0	0	3	N/A	N/A	0	3

					Potential Detrimental Disturbance*							
					ALT 1 (No Action)		**ALT 2** (Proposed Action)		**ALT 3** (No Temp Roads or Girdling)		**ALT 4** (Fewer Units than in Alt 2)	
Unit	**Acres**	**Harvest System#**	**Site Prep**	**% Detr. Dist. Soil** (Existing Condition)	**% of Activity Area** (above existing)	**Acres of Activity Area**	**% of Activity Area**	**Acres of Activity Area**	**% of Activity Area**	**Acres of Activity Area**	**% of Activity Area**	**Acres of Activity Area**
52	29	GIRD	N/A	N/A	0	0	0	2	N/A	N/A	0	2
53	20	T	GP/UB	10	0	0	13	3	13	3	13	3
54	38	GIRD	N/A	N/A	0	0	0	1	N/A	N/A	0	1
55	13	GIRD	N/A	N/A	0	0	0	3	N/A	N/A	0	3
57	39	**T**	GP/UB	0	0	0	10	4	10	4	N/A	N/A
58	48	S	UB	0	0	0	2	1	2	1	N/A	N/A
59	46	S	UB	0	0	0	2	1	2	1	2	1
60	133	H	UB	2	0	0	2	3	2	3	2	3
61	87	H	UB	8	0	0	8	7	8	7	N/A	N/A
62	30	**S**	GP/UB	1	0	0	5	2	5	2	N/A	N/A
63	27	S	UB	2	0	0	2	1	2	1	N/A	N/A
66	52	S	UB	4	0	0	4	2	4	2	N/A	N/A
69	46	H	GP/UB	0	0	0	5	2	5	2	N/A	N/A
111	51	S	UB	0	0	0	2	1	2	1	N/A	N/A
112	30	T	UB	0	0	0	13	4	13	4	N/A	N/A
122	256	T	UB	2	0	0	13	33	13	33	13	33
125	123	T	GP/UB	5	0	0	13	16	13	16	N/A	N/A
129	86	**T**	GP	6	0	0	10	9	N/A	N/A	10	9
134	86	T	GP/UB	11	0	0	13	11	13	11	N/A	N/A
135	39	T/S	GP/UB	10	0	0	10	4	10	4	N/A	N/A
140	128	S	GP/UB	4	0	0	5	6	N/A	N/A	5	6
900	110	Ecoburn	N/A	N/A	0	0	2	2	N/A	N/A	2	2
901	128	Ecoburn	N/A	N/A	0	0	2	2	N/A	N/A	2	2

Information for data displayed in this table:

· All acres are approximations subject to slight rounding errors.
· Units 16, 27, 28, 30, 61, 66, and 135 have existing impacts that exceed those expected to occur with the proposed harvest. The existing percent and acres of detrimental disturbance were therefore transferred as cumulative effects into the proposed Alternatives calculations.
· All multi-logging system unit acres were divided 50/50 except Unit 7 (70/30).
* with mitigation.
# Units with harvest systems in bold will be winter logged.
+ Helicopter landings will be located in the valley on private land and are therefore not counted.
** Landings are for helicopter units 60, 61, and 69. All other landings are located on system or temporary roads.
^ Percent impacts were calculated using 4274 acres of total activity area to provide a comparison of impacts of all other Alternatives relative to proposed Alternative 2.

ISW – Irregular Shelterwood
CT – Commercial Thin
GS – Group Select
ST – Seed Tree
H – Helicopter
S – Skyline
T – Tractor
Gird – Girdling
GP – Grapple Pile
UB – Underburn

Table A-7 continued – Potential Impacts following guidelines in Niehoff (2002)

Soil Resource Potential Effects Indicator	Alt 1 No Action	Alt 2 Proposed Action	Alt 3 No Temp Roads or Girdling	Alt 4 Fewer Units than in Alt 2
Number of Helicopter Landings (1 acre / each landing)	0	3 landings = 3 acres	3 landings = 3 acres	0 landings = 0 acres
Temp Roads – measured in acres	0	21 acres	0 acres	21 acres
Total Activity Area	0	4275 acres	3325 acres	3311 acres
Total Impact – measured in acres	0	347	254	269
Total % Impact on Activity Areas	0	8.1%	5.9%	6.3%

(amounts shown are approximate acres)

f. Environmental Consequences

Introduction

This section provides information regarding the potential consequences on the soil resource that may be affected by the proposed actions. All direct, indirect, and cumulative effects are disclosed, qualitatively discussed, and quantified where possible.

Direct Effects

Direct Effects are caused by the action and occur at the same time and place.

Compaction, displacement, rutting, erosion, and severe burning from management activities can have direct effects on the soils physical, chemical, and biological properties. The duration of impacts on the soil resource depend primarily on soil texture, parent material, aspect, slope, climate, and degree of disturbance. The analysis of direct and indirect effects is based on how the various components of the project (e.g., location, activity area, logging systems, road construction, and reasonable foreseeable actions) are expected to affect soils in the Mission Brush project area.

Ground-based Yarding - The greatest detrimental impacts are expected from ground-based yarding and generally average around 13 percent (Niehoff 2002) when protection measures are in place. The majority of disturbance is created through compaction, displacement, erosion, and rutting. Coefficients used to estimate effects on soils from proposed logging systems are shown in the following table.

Helicopter and Skyline Logging - These systems tend to have less detrimental effects (Niehoff 2002, McIver and Starr 2000, pp. 11-16) than ground-based systems because equipment stays on the road or in the air - with helicopter logging - and logs are partially or fully suspended over the ground. Soil impacts from skyline logging are caused when one end of a log is dragged over unprotected ground (Krag 1991, Seyedbagheri 1996 pp. 7-9).

Broadcast Burning and Piling - Past monitoring has found no detectable degradation of soil when broadcast burning occurs while soil moisture content is at or above 25% (Niehoff 1985). Additional soil impacts are expected from grapple piling (Table A-8) but can be lessened if machinery operates on slash mats, is limited to slopes less than 35 percent, and does not displace surface soils. These actions would not involve skidding logs.

Table A-8. Coefficients used to predict potential detrimental disturbances for proposed logging and slash treatment scenarios including burning and piling (Niehoff 2002).

Tractor Logging	Detrimental Disturbance Coefficients (%)
With broadcast burning or grapple piling on slash mat	13
Winter logging	10
Skyline or Helicopter Logging	
With broadcast burning	0 - 2
Fall burned on SE to SW aspects	2
With grapple piling (generally perimeter only)	3

Roads and Landings - Roads and landings that remain on the landscape for future use (system roads) are considered irretrievable effects on productivity as these lands become "dedicated" to the permanent transportation system. Temporary roads (i.e., only needed for the project) have detrimental effects initially. Although rehabilitation through decompaction and/or recontouring cannot assume complete reversal to natural conditions, efforts initiate a long-term recovery process.

Indirect Effects

Indirect Effects are caused by the action and occur later in time or are spatially removed.

Indirect effects on soils may include the potential loss of site productivity due to removal of large woody debris and nutrients, loss of soil wood, and their resulting effects to vegetative and hydrologic processes. Erosion, mass wasting, soil biology, and fertilization effects of ash after fire can also be of consequence.

Direct and Indirect Effects

Direct and indirect effects on the soil resource are described below for proposed activities. Effects were assessed based on their potential to create detrimental impacts and to impair soil productivity in the activity areas.

a. Effects Common to All Alternatives

Effects of Wildfire

Natural disturbance events commonly reset watersheds and influence water quality and stream habitat. Wildfire is a natural component in forested ecosystems, and has influenced soil and watershed processes for thousands of years. However, as a result of fire suppression during the last century, natural fire regimes do not exist anywhere in north Idaho today (Smith and Fisher 1997).

The continued accumulation of dead and down fuel loads could contribute to an increased potential for locally severe fire effects on soil. Deteriorating effects of wildfires on soils usually include loss of organics and nutrients and a reduction of water infiltration (Wells et al. 1979, p. 26). Burns that create very high soil surface temperatures, particularly when soil moisture content is low, result in an almost complete loss of soil microbial populations, woody debris, and the protective duff and litter layer over mineral soil (Hungerford 1991; Neary et al. 2005). Since erosion increases following a fire are often directly proportional to fire intensity (Megahan 1990, p. 146), the removal of ash-capped surface soils could reduce soil productivity.

Depending on the intensity of the fire and the severity of its effects, wildfire can alter watershed soils by consuming the erosion-limiting litter layer and the binding organics within the soil (Ice 2003). Condensation of volatized organics on soil surfaces often result in water-repellant (hydrophobic) soil conditions (DeBano 1981; Doerr et al. 2000; Dyrness 1976) that can contribute to overland flow and increased in-channel failures (Ice 2003).

Fire-induced soil hydrophobicity is presumed to be a primary cause of the observed post-fire increases in runoff and erosion from forested watersheds (Huffman et al. 2001). Though hydrophobicity is a naturally occurring phenomenon that can often be found on the mineral soil surface, it is greatly amplified by increased burn severity (Huffman et al. 2001; Neary et al. 2005).

Soil hydrophobicity usually returns to pre-burn conditions in no more than six years (DeBano 1981; Dyrness 1976) and other studies have documented a much more rapid recovery of one to three years (Huffman et al. 2001). The persistence of a hydrophobic layer will depend on the strength and extent of hydrophobic chemicals after burning and the many physical and

biological factors that can aid in breakdown (DeBano 1981). This variability means that post-fire impacts on watershed conditions are difficult to predict and to quantify.

If a wildfire occurred, consequent resource damage from mechanized suppression activities and burn severity could range from negligible to severe, depending on location, size, severity of burn, and subsequent administrative activities. Primary risks for erosion and mass failure would be from slopes and associated roads, especially at stream crossings in the event of debris flows. These risks are discussed in more detail in the aquatics section. Loss of soil productivity could be extended depending on burn severity, location, and post climate characteristics. Following a severe fire, rehabilitation efforts to mitigate the fire's effects on erosion and sediment delivery would likely occur, substantially reducing potential negative effects.

b. Effects from Activities on Private Land

There are activities on private industrial forestland within the Mission Brush project area with activities consisting of regeneration harvest and pre-commercial thinning. Merchantable timber on the private sections in the project area was removed starting in the 1940s through 2003 (Table A-2 above) and will likely continue indefinitely.

c. Alternative 1 - No Action

Under this alternative, no new management-induced detrimental direct or indirect impacts would occur in the Mission Brush project area. No effects to soils would take place in Alternative 1 as no road construction, road decommissioning, logging, or fuels treatments would be added.

Existing soil compaction and displacement would persist with very slow natural recovery of compacted soils. No soil restoration or watershed improvement activities would occur, so the long-term net improvement of soil conditions would be slower in untreated potential soil restoration areas.

Soil potassium and nitrogen would continue to cycle, build up at current rates, and not be subject to removal due to fuels reduction. Soil nutrient cycling would continue in the soil at low rates from rock weathering, atmospheric deposition (mostly nitrogen), and nitrogen fixation. Soil nutrients would be bound in organic matter complexes and slowly released through decay.

The continued accumulation of dead and down fuel loads could contribute to an increased potential for locally severe fire effects on soil, including physical alteration of soil structure and development of hydrophobic layers. This could increase mass wasting potentials on steeper slopes due to reduced stability. However, compaction and displacement from a potential natural wildfire are not likely.

<u>Alternative 1 – No Action</u>
Potential Impacts on Soils

Soil Disturbance
- No management induced disturbance would occur.

Soil Productivity
- No management induced alteration of current erosion or mass movement.
- Litter, duff, and fuel loads would continue to accumulate until major disturbance occurs
- Existing soil compaction and displacement would persist in Unit 16.
- Soil nutrient cycling would continue.
- Stands currently at high risk for mortality would not be treated.
- No roads would be constructed, decommissioned, improved, or put into storage.

If high severity fire occurs:
- Hydrophobic soils could reduce water infiltration.
- Soil erosion and mass movement could occur, depending on location.
- Reduced soil productivity would be possible through loss of organics (duff, soil wood, coarse woody debris), nutrients, and microbial populations.

If a wildfire occurred, consequent nutrient loss, soil erosion, and resource damage from mechanized suppression activities and burn severity could range from negligible to severe, depending on location, size, severity of burn, and subsequent administrative activities.

On existing roads, no change in use, management, or maintenance would occur on Federal land in the foreseeable future. In the event of a fire or rain-on-snow event, roads can be a major contributor to sediment production (see aquatics section in Chapters 2, 3 and 4 of the SFEIS).

The introduction of weeds and unwanted flora following a fire could lead to higher competition between less desirable and native vegetation. In the absence of a hot fire, nutrients would be retained on site.

Diseased trees would remain and infection centers would likely increase in size and concentration. Stands currently at high risk

for mortality would not be treated, which may increase the risk of stand loss due to wildfire, severe burning, and loss of soil nutrients.

g. Alternatives 2, 3, and 4

Effects of Vegetation Treatments

Alternative 2 – Proposed Action

The action alternative proposes regeneration or partial regeneration cutting in 51 units on 1634 acres and partial cutting on 2266 acres (for 3900 acres total) using a combination of helicopter (33%), cable (15%), ground-based systems (31%), and a combination of methods (22%). These vegetation management activities have the potential to cause detrimental soil disturbances, such as compaction and displacement, by removing an estimated 347 acres (8.1 percent) of the total activity area from a long-term productive growing state (Table A-7 above). Fuel treatments are proposed on all 3900 acres and consist of 763 acres (19%) of grapple piling, 1737 acres (45%) of underburning, and 1400 acres (36%) of grapple piling with follow-up underburn.

Alternative 3 – No Temporary Roads or Girdling

The action alternative proposes regeneration or partial regeneration cutting in 36 units on 1358 acres and partial cutting on 1967 acres (for 3325 acres total) using a combination of helicopter (38%), cable (13%), ground-based systems (26%), and a combination of methods (23%). These vegetation management activities have the potential to cause detrimental soil disturbances, such as compaction and displacement, by removing an estimated 254 acres (5.9 percent) of the total activity area from a long-term productive growing state (Table A-7 above). Fuel treatments are proposed on all 3325 acres and consist of 417 acres (13%) of grapple piling, 1760 acres (53%) of underburning, and 1148 acres (34%) of grapple piling with follow-up underburn.

Alternative 4 – Fewer Units

The action alternative proposes regeneration or partial regeneration cutting in 43 units on 643 acres and partial cutting on 2294 acres (for 2937 acres total) using a combination of helicopter (37%), cable (4%), ground-based systems (28%), and a combination of methods (31%). These vegetation management activities have the potential to cause detrimental soil disturbances, such as compaction and displacement, by removing an estimated 269 acres (6.3 percent) of the total activity area from a long-term productive growing state (Table A-7 above). Fuel treatments are proposed on all 2937 acres and consist of 764 acres (25%) of grapple piling, 1315 acres (47%) of underburning, and 857 acres (28%) of grapple piling with follow-up underburn.

All Alternatives
Potential Impacts on Soils

Soil Disturbance

Alternative 2
- Meets soil quality standards in 58 units.
- Exceeds soil quality standards only in Unit 16.

Alternative 3
- Meets soil quality standards in all 36 units.

Alternative 4
- Meets soil quality standards in 42 units.
- Exceeds soil quality standards only in Unit 16.

Soil Productivity

Alternative 2
- Detrimental disturbance on about 347 acres (includes temp road disturbance).
- Whole-tree yarding on about 14 acres in Unit 12 due to excessive fuel load.
- Net improvements would occur in Unit 16, which is currently exceeding soil quality standards.

Alternative 3
- Detrimental disturbance in about 254 acres. No temp road disturbance.
- No net improvements would occur in Unit 16.

Alternative 4
- Detrimental disturbance in about 269 (includes temp road disturbance).
- Whole-tree yarding on about 14 acres in Unit 12 due to excessive fuel load.
- Net improvements would occur in Unit 16, which is currently exceeding soil quality standards.

All Alternatives
- Reduced nutrients on site but mitigated by overwintering in all units except on about 40 acres along the Forest Service boundary to private land on the western slopes of Hall Mountain.
- Coarse woody debris would be retained at appropriate levels.
- Localized areas of soil sterilization, reduced water infiltration, and lost ground cover below burn piles.
- Short-term reduction in ground cover due to prescribed burns, skid trails, and skyline corridors.
- Removal of numerous live trees may increase risk of local mass failures, especially near roads.
- Reduction and improvement of stands currently at high risk for mortality.

If a low to moderate severity fire occurs:
- Minor soil erosion and mass movement would be possible, depending on location.
- Small and, in most cases, acceptable effects would influence soil health and productivity.

Effects are directly proportional to the extent of the activities and disturbance is predicted to be highest in activity areas subjected to tractor logging during non-winter months. Disturbances would occur on areas proposed for skyline yarding, but would result in minor detrimental impacts. Grapple piling in skyline and helicopter units would mainly occur around the perimeter if slope gradient is not to steep.

Field sampling of representative units with past timber harvest indicates a range of existing soil damage from negligible (such as firewood cutting) to 16 percent (Table A-7 above). The areas proposed for ground-based timber harvest are most vulnerable to exceeding soil quality standards for aerial extent of disturbance upon completion of activities. Ground-based yarding on moderate slopes (<35%) is currently proposed in 22 units and partially within 6 units.

The majority of activities would occur during dry summer months on ~2794 acres for Alternative 2; 2720 acres for Alternative 3; and 1985 acres for Alternative 4. Winter logging would take place on ~1106 acres in Alternative 2; 605 acres for Alternative 3; and 952 acres for Alternative 4, primarily in the southern portion of the project area near Brush Lake. Mandatory winter logging due to watershed concerns (see aquatics section) is proposed for Units 57 and 62. Unit 38 is also recommended for winter logging to mitigate for potential instability concerns caused by the presence of compacted tills and associated increased seepage.

Site specific design prior to unit layout required that proposed activities should avoid landtypes that are known to pose a potential hazard. Additional local areas of concern, such as the western slopes of Hall Mountain, were identified during reviews. To protect soils and slope stability, all proposed units at this location will be thinned through helicopter logging and should retain an estimated 60 percent of canopy to provide for adequate root retention and soil water removal.

Whole tree removal is proposed under all alternatives on ~40 acres along the Forest Service boundary to private land below the steep helicopter units at Hall Mountain. Removal of trees and exclusion from overwintering logging debris along ~2.75 miles would extent an estimated two chains (122 feet) into Units 28, 30, 31, and 32. Additional whole tree logging is proposed on ~14 acres in Unit 12 under Alternatives 2 and 4. Tops would be lopped for nutrient retention and overwintering though the remainder of larger trees would be whole tree yarded since the projected fuel loading would be too high to be managed effectively.

Girdling of larch and Douglas-fir is proposed on 136 acres in Units 21, 43, 51, 52, 54, and 55 under Alternatives 2 and 4. This operation is done with the aid of chainsaws and does not involve any use of logging equipment, therefore no detrimental soil disturbance is expected to occur. The treated trees would remain on-site and provide coarse woody material for future long-term productivity. No burning is associated with any of these units.

Timber harvesting would open up tree canopies, and logging slash from tree limbs, tops, and un-merchantable pieces would add to existing short-term fuel loadings. Canopy removal would allow wind and sunlight to penetrate, heat, and dry the debris, which could increase potential fire intensity and severity until the slash is treated or naturally abated by being compacted by snow and naturally recycled. However, the long-term risk for stand-replacing wildfire would be reduced by creating more open stand structures that would have lower accumulations of large diameter fuels, and that would be less likely to support crown fires.

Soil compaction effects can last for decades but are not irreversible. Depending on factors such as soil texture, aspect, slope, and degree of disturbance, conditions can be naturally restored over time through root growth, seasonal climate changes, and bioturbation. Soil displacement that mixes or removes the volcanic ash surface layer, however, reduces soil moisture holding capacity and associated productivity, which is essentially irreversible.

Effects of Temporary Roads and Landings

Alternatives 2 and 4 propose temporary road construction on approximately 5 miles to move personnel, logs, and/or equipment to complete harvest and fuels treatments (Table 2 – Suppl. EIS). The majority of proposed temporary roads would be re-constructed on already existing old roadbeds with the exception of ~0.8 miles of new construction to access Unit 19. This would cause soil compaction, displacement, and effects to site productivity on approximately 21 acres assuming an average road width of 35 feet.

Upon treatment completion, all 5 miles (plus ~13 miles of existing roads – Table 2 in Suppl. EIS) would be decommissioned to no less than the current state, which includes culvert removal, ripping the road prism, restoring stream channel crossings, seeding, fertilizing, and topping the areas with woody debris and organic matter. No temporary road construction would occur under Alternative 3. A more detailed discussion of road effects and additional road decommissioning, storage, and improvements can be found in the aquatics section.

All landings will be located on system roads. Additional landings associated with helicopter logging at Hall Mountain would be situated on private land in the Kootenai Valley. Alternatives 2 and 4 would add the construction of three helicopter landing pads (~3 acres total) for units 60, 61, and 69.

Effects of Mitigation Measures

Mitigation and preventative measures, such as use of aerial logging, use of existing skid trails, slash mats, and winter logging would keep proposed harvest impacts under 15% for the units that are currently below this level. Design and mitigation measures and their effectiveness to limit harvest impacts are described in detail at the end of this document.

Soil quality standards exceed in Unit 16 which was evaluated for soil restoration needs (project file). Harvest and site preparation operations would strictly adhere to utilizing existing skid trail corridors and slash mat use. The restrictions should provide adequate protection so that current conditions are not exceeded. Post-harvest monitoring is scheduled to assess if mitigation objectives in these units were met.

Under Alternatives 2 and 4, provision for net improvement on previously impacted activity areas would be achieved through soil restoration activities that would affect existing detrimental disturbance in Unit 16. This would be accomplished through decompaction, addition of organic matter, seeding, and weed control. Effectiveness is low to moderate (Heninger et. al 2002) but decompaction would provide for improvements in hydrologic function and would initiate a recovery process that otherwise may be prolonged as soil compaction from past and proposed harvest activity persist. Unit 16 would not be harvested under Alternative 3 so that existing disturbances would remain and not be improved.

Effects of Activities on Soil Productivity

Harvest is the removal of nutrients that have been accumulated in the woods over time. Harvesting the tree bole only would remove about 14 percent of the tree's potassium potentially causing indirect effects to some plants. Following the management recommendations from the Intermountain Forest Tree Nutrition Cooperative (IFTNC) would minimize any additional loss of potassium and nutrients from treated areas by overwintering slash. Additional measures include planting western larch, ponderosa pine, and western white pine that require less potassium than species with increased abilities to sequester nutrients, like Douglas-fir or grand fir (Garrison and Moore 1998).

Effects of whole tree harvesting on the growth of trees are greatly influenced by rotation cycles and logging prescription. As long as rotations are extended, the depletion of major nutrients needed by plants should not be excessive in relation to total reserves in the soil that should replenish between harvests. In an effort to keep nutrient reduction to a minimum, logging systems and site preparation options were incorporated to reduce the acreage impacted by whole-tree yarding. However, under all alternatives, whole trees are proposed to be removed along the Forest Service boundary to private land (~40 acres total) on the west side of Hall Mountain due to fire concerns and to improve suppression conditions in the event of a fire. Additional whole tree logging is proposed on ~14 acres in Unit 12 under Alternatives 2 and 4. Tops would be lopped for nutrient retention and overwintering though the remainder of larger trees would be whole tree yarded since the projected fuel loading would be too high to be managed effectively.

Whole tree yarding will remove tops and limbs and is likely to result in about twice as much potassium loss as bole-only yarding, so that the affected land may sustain a greater nutrient loss than the remaining activity areas. On the other hand, some foliage and limbs would remain on site due to breakage during harvest and contribute to the nutrient pool.

Conventional removal (lop and scatter) rather than whole-tree yarding would be practiced in all remaining units. Slash would remain on site over-winter so that mobile nutrients, such as potassium, can leach from fine materials back to the soil. Broadcast burns would be "light" in nature and would foster the release of tied up nutrients. These measures would likely reduce the occurrence of nutrient-influenced, insect and disease-caused mortality in the future.

Indirect effects of soil nutrient loss include reduced growth and yield and increased susceptibility to pathogens, such as root disease (Garrison and Moore 1998) and insect infestation (Garrison-Johnston et al. 2003). Precipitation (Stark 1979) and weathering of rocks will continue to make additional nutrients available on site. Annual needle and twig fall, forb, and shrub mortality have and will continue to recycle nutrients as well.

Effects of Activities on Coarse Woody Debris and Organic Matter

The amount of coarse woody debris present in the project area varies greatly. Many stands, especially those proposed for first entry, contain high amounts of downed wood originating from root disease and beetle infestation. These amounts greatly exceed the recommendations of Graham et al. (1994) and Brown et al. (2003) and contribute to hazardous fuel loading. Historically, fire would have moderated the amount of accumulated coarse woody debris (Smith and Fischer 1997).

Approximately 7 to 14 tons per acre of coarse woody debris would be left on Douglas-fir/grand fir sites and 17 to 33 tons/acre on hemlock/cedar sites for coarse woody debris recruitment. This would provide a long-term source of nutrients and organic matter as well as protection against soil erosion (Brown et al. 2003; Graham et al. 1994).

Organic matter varies throughout the activity areas with depth of organic matter generally correlating to habitat type and aspect. Organic matter content is usually high on moist sites and northerly aspects and low to optimum on dry sites. Potential loss or reduction of organic matter can lead to a decline in several key soil and foliar nutrients (Powers 2005).

Indirect effects of soil wood loss include altered processes of forest regeneration and growth, favoring species requiring lower soil moisture, lower nutrient levels, and greater potential for soil erosion. Additional effects could also include loss of habitat for species requiring soil wood as dens or substrate for invertebrates, and bacteria and fungi, which affect food availability for small rodents and their predators.

Effects of Ecoburns, Prescribed Burning, and Slash Disposal

Under Alternatives 2 and 4, ecoburns are proposed on 238 acres of existing shrub fields around Bethlehem Mountain to enhance wildlife habitat and to treat existing fuels. The effects of fire on detrimental soil conditions (altering soil properties and runoff) are directly proportional to the severity of the fire: the more intense the fire, the more damage occurs. No ecoburning would take place under Alternative 3.

Increased soil heating could alter infiltration rates, soil nutrients, and reduce protective vegetation, litter and duff (Hungerford et al. 1991). Direct and indirect effects of fire on soil nutrients include reduced plant growth and yield (Hungerford et al. 1991; McNabb and Cromack 1990; Neary et al. 2005), increased susceptibility to pathogens such as root disease (Garrison and Moore 1998) and insect infestation (Garrison-Johnston et al. 2003), and increased depth and duration of seasonal thawing for a period of at least 15 years following fire (Viereck 1973). However, these effects can be minimized by reducing the loss of forest floor by using a low intensity burn when soils have adequate moisture conditions to retain their biological, chemical, and physical integrity (Barnett 1989; Frandsen and Ryan 1986; Hungerford et al. 1991; McNabb and Cromack 1990).

The affected brush vegetation in the proposed action would likely burn in a mosaic pattern due to low to moderate fire intensities and therefore, is less likely to create slope instability. Most of the root systems of trees and shrubs will remain intact and effectively provide slope stability while the vegetation reestablishes itself (generally within 1-3 years). Root strength will also help maintain evapotranspirational processes that remove excess soil moisture, consequently reducing mass wasting risks on individual sites.

However, if the fire severity increases to moderately high or high, it could result in detrimental soil conditions, such as an increase in water repellency, that consequently could increase the potential risk of mass failure, erosion, sediment delivery from overland flow (DeBano 1981; Doerr et al. 2000; Ice 2003).

No measurable negative effects on soils are anticipated from the post-harvest underburning if slash is allowed to over-winter on site to leach nutrients prior to piling or burning, and if soil moisture content is ≥25% when the burning occurs. Prescribed burns would have limited detrimental effects when executed in the spring. These requirements would also maintain coarse woody debris and reduce the potential for hydrophobic conditions or significant nutrient loss.

When burn piles are large, nutrient losses from heat and volatilization could be considerable. Mitigation therefore recommends that burn piles be small and numerous rather than large and few. In some cases, burning of the slash piles would create small patches of hydrophobic soils for as much as one to two years, but the areas would not be large or extensive enough to alter the slope hydrologic response or slope stability.

Design features also require piling machinery to operate on a slash mat and on slopes less than 35% to prevent soil disturbance in excess of guidelines. These activity areas would be accessed from existing roads, and skid trails around or within the proposed units. Only areas that could be reasonably accessed would be treated and none of the trails would be excavated to

facilitate access. The residual logging debris that was lopped and scattered or that could not be grapple piled and burned would increase potential fire intensity and severity for a few years until snow could compress the debris and the fine organics would decompose. Untreated forest and riparian habitat conservation areas between the grapple piling activity and the stream networks would prevent sediment delivery to stream channels.

Effects of Reforestation

Planting would be done by hand crews and access would occur from existing system roads. This activity would reduce the amount of time needed to recover vegetation, hydrologic function, and soil productivity after regeneration harvesting. A reduction in potential sediment production and delivery as well as potential mass movement could be expected with establishment of reforested activity areas.

Effects of Noxious Weed Control

Most of the noxious weed control used in the Mission Brush project area has been biological. However, herbicides have been applied sparingly and judiciously on noxious weeds in the project area in accordance with the requirements of the Bonners Ferry Noxious Weed EIS (USDA 1996). Noxious weed treatments do kill vegetation that reduce vegetative ground cover, but do not remove protective organic layers and occur over relatively small treatment areas away from streams. Therefore, this activity is not expected to degrade soils, add to sediment production and delivery, or affect wildfire risk.

h. Cumulative Effects

Cumulative Effects - The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Spatial Scale - the appropriate scale, or geographic bounds, for cumulative effects analysis relates to an area that would be affected by the proposed action or reasonable alternative. This area is referred to as the cumulative effects analysis area and may vary between resources. The task of selecting the geographical boundaries involved several factors, including the scope of the project considered and the features of the land. Since direct and indirect effects from soils are measured within "activity areas," the cumulative effects analysis area for the soils resource consists of the unit scale (activity areas where management activities are proposed) and watershed scale (entire project area).

At the unit scale, activities that cause soil impacts may have cumulative effects – i.e. soil porosity, water holding capacity, aeration, long-term productivity etc. – with repeated entries. At the watershed scale, cumulative effects due to physical, chemical, and biological impacts increase with the scope of past and proposed activities (Reid and Hilton 1998).

Temporal Scale - the temporal scale is dependent on the specific issue being addressed with no one scale being appropriate for all issues. The analysis may need to evaluate the effects of proposed management over all seasons for several days, years, decades, or perhaps centuries. This is complicated by data constraints that require monitoring to detect change – though data are often insufficient to identify even trends or trajectories of change until the impact is large enough or has been occurring for some time. Furthermore, there is often a lag between some action and its observed effect. This analysis strives toward an integrated approach to soil processes and function to project future trends in response to proposed management options to the best of abilities.

Generally, detrimental effects on soils are not permanent and depend primarily on soil texture, parent material, aspect, and level of compaction. Recovery time is on the average 30 to 70 years as second growth timber becomes established around disturbed areas (Dykstra and Curran 2002; and Froehlich et al. 1983 and 1985). However, soil displacement that mixes or moves the volcanic ash surface layer and reduces soil moisture holding capacity and productivity is essentially irreversible.

Past Activities

Past actions contribute to the baseline conditions that provide a foundation for the analysis (e.g. previous timber harvesting, road building, and fire suppression actions since the early 1900s). Past activities, such as timber harvest, are listed in Table 3-1 (2004 FEIS) for Forest Service land and in Table 4 (Ch. 3 - Suppl. EIS) for private land.

Walkthrough surveys of areas proposed for treatment, communication with district personnel, and timber records indicate that

regulated timber harvest started on Forest Service land in the project area around 1974 and continues into the 2000s with many earlier records being incomplete or non-existent.

Though timber harvest prior to the 1970s was limited in scale, logging activities have been ongoing and past harvest activities has occured on ~10,100 acres of private and Federal land within the project area. How much of these acres are detrimentally impacted can only be speculated, especially since a portion (~35%) of the affected land is private. Effects on soil productivity from these activities are site specific attributes of the land on which they occur.

Intensive mechanized harvest prior to the 1990s was widespread on private and Forest Service land and often highly impacting (Niehoff 2002) with unconstrained tractor skidding, dozer piling or windrowing, and hot burning of slash and burn piles. Skidding was often done on steeper ground and more dispersed than might occur today. No soil restoration occurred and riparian harvest was still the norm until the mid 1990s.

By then, some controls may have been imposed on tractor skid trail spacing, season of use, or riparian harvest, but compaction and displacement were still widespread in most areas. Units with fewer effects had often been winter logged or had no mechanical slash treatment. By the end of the 1990s, broadcast burning had become more costly than machine piling so that ground impacts from mechanized site preparation once again increased.

Roads constructed in the past provide access to Federal and private land in the Mission Brush project area (see aquatics section for more detail). System roads were removed from productivity when they were constructed and have little additional effect on the area if they are properly maintained (i.e. functioning culverts, drainage structures, surface etc.). Minimal short-term impacts to soils are anticipated from proposed road maintenance activities, which consist of blading, drainage improvement, and surfacing.

Conversely, unmaintained or improperly maintained roads are identified to be one of the main sources of sediment contribution to streams through erosion, sediment routing, and slumping. The reader is referred to the aquatics report for a detailed discussion of road related sediment concerns. Implementation of appropriate BMPs and the mitigation measures defined in Design Criteria will reduce road related sediment.

Records of historic wildfires in the vicinity of the Mission Brush project area (Fig. 3-9, 2004 FEIS) reinforce the potential probability and risk for future wildfires, especially if a fire ignites in an untreated area under dry weather conditions. Extensive wildfires in the extended area, such as the Sundance fire of 1967, burned several drainages of the Selkirk Mountains. Soils at high elevations, and particularly south-facing aspects, still display reduced productivity to this day.

Present Activities

Fire suppression activities over the last century within the project area have allowed stands to progress towards climax vegetative conditions in much of the cumulative effects area. The current trend is toward more shade tolerant species composition, which are not as long-lived and more susceptible to insects, disease, and consequently fire. Since changes in soil water content are associated with proposed fuel reduction activities, the existing and future trend could have an effect on potential slope stability.

Timber harvest activities could occur on private land at any time but must follow the rules and Best Management Practices (BMPs) set by the Idaho Forest Practices Act (Title 38, Chapter 13, Idaho Code). These rules and BMPs are designed to prevent sediment delivery to stream channels and to prevent any cumulative watershed effects. However, activities on private land that lead to soil degradation may contribute to the cumulative condition.

On Federal land, current activities on the Harebrush timber sale occur within the Mission Brush project area and were analyzed in the Rock Bottom EA (USDA 1996). Activities left to be completed associated with this timber sale affect a small portion of the southeastern corner of the proposed project area south of Brush Lake. Completion of harvest and site preparation tasks is open ended and eventually based on available burn windows and soil moisture conditions. No other logging, hauling, or site preparation associated with harvest activities on Federal land take place presently. No additional effects to watersheds beyond what was analyzed for and disclosed in the Rock Bottom EA (USDA 1996) are expected to occur.

The project area is open for recreation with most individuals using motorized access to pass through and to hike, hunt, or camp in the area. The project area receives snowmobile use and will likely see an increase in recreational vehicle access. This will force additional needs in road and trail maintenance. Illegal motor vehicle use occurs, but is infrequent at this point. One campground at Brush Lake is available in the project area.

Reasonably Foreseeable Activities

Other than the proposed activities, there is no reasonably foreseeable timber harvest scheduled to occur on Federal land in the analysis area (see Chapters 2 and 4, SFEIS). However, salvage opportunities may take place, if a wildfire should happen within the project area. No additional disturbance would occur (e.g. salvage must meet INFISH guidelines, would not take place on high risk soils or where it may adversely affect floodplains, wetlands, or if it can adversely affect threatened, endangered, or sensitive fish species or their habitat; there would be no new road construction, and only existing skid trails would be used).

Noxious weed monitoring and treatment would continue and would follow guidelines established in the Bonners Ferry Noxious Weeds Control Project EIS (USDA 1998). Effects to soil resources were analyzed in the document and its adaptive strategy. No additional effects to soils beyond what was analyzed for and disclosed in this EIS are expected to occur.

Prescribed burning and slash disposal in several previously untreated units of the Harebrush timber sale will take place. Completion of these tasks is open ended based on available burn windows and soil moisture conditions. Prescribed burning activities would follow applicable INFISH standards and guidelines, as well as established BMPs, which would substantially reduce or eliminate the impact of these activities on the soil resource.

On private land, logging activities are possible on any of the sections in the Mission Brush project area within the next 5 years. Timber harvest on private land must follow the rules and Best Management Practices set by the Idaho Forest Practices Act (Title 38, Chapter 13, Idaho Code). Though most of the activities on private land that detrimentally disturb soils, impair soil productivity, and increase soil water content are site specific, potential contribution to the cumulative condition are possible. Future road decommissioning and culvert improvement activities are expected in any of the watersheds within the project area. Road decommissioning and soil restoration would contribute to a reduction in compaction, thus improving infiltration and reducing surface runoff (Switalski et al. 2004). Removing or replacing culverts is expected to have short-term impacts on sediment yield below the crossing sites.

The gathering of firewood within the project area will continue. This activity removes standing dead and down trees that contain little if any fine fuels, usually within 100 feet of open roads. With the minor amount of wood removed and small area impacted, this activity has very little effect on the soil resource.

a. Alternative 1 – No Action

In addition to the direct and indirect effects, Alternative 1 would not add to cumulative soil effects unless severe burns, as previously described, would occur. Since there would be no ground-disturbance to cause detrimental soil effects, there would be no activities contributing to cumulative effects.

b. Alternatives 2, 3, and 4

Effects of Vegetation Treatments on Soils

The effects of past activities, including timber harvest on the soil resource, were considered in the establishment of the existing condition in proposed activity areas. The anticipated effects of proposed activities were incorporated to this existing condition and evaluated for cumulative effects against the Regional Soil Quality Standards as displayed in Table 5.

Potential cumulative detrimental impacts from proposed activities in addition to past activities affect Unit 16 (Table A-7 above) which was tractor logged during the Uproaring salvage sale in 1996. Design criteria and mitigation would provide a net improvement after completion of harvest activities under Alternatives 2 and 4 for this activity area. The following table provides a comparison of cumulative effects for Alternatives 2, 3, and 4 from past and proposed activities assuming mitigation measures are incorporated. Detrimental impacts in stands would be localized on new skid trails or existing trails and would be incorporated into the proposed harvest design. Fall burns on southeast to southwest aspects may also increase impacts on soils.

Table A-9. Comparison of vegetation treatment effects and roads on soils for Alternatives 2, 3, and 4
(includes girdling and ecoburn units)

	Alternative 2	Alternative 3	Alternative 4

	Acres	% Impact*	# of Units	Acres	% Impact*	# of Units	Acres	% Impact*	# of Units
0 to 5%	70	1.6	29	47	1	17	56	1.3	21
6 to 9%	36	0.8	4	36	0.8	4	29	0.7	3
10 to 15%	212	5.0	25	168	3.9	15	158	4.0	18
>15%	5	0.1	1	0	0	0	5	0.1	1
Helicopter Landings	3	0.07		3	0.07		0	0	
Roads	5	0.1		0	0		5	0.1	
Total	347	8.1	59	254	5.9	36	269	6.3	43

*The Percent impact displayed is relative to the total activity area in Alternative 2 (approximately 4274 acres) to provide a comparison with the proposed action alternative (Alternative 2).

Effects of Vegetation Treatments on Slope Stability

Proposed harvest activities can increase the potential for mass failure from increased soil water content, reduced and decomposing root mass, and decreased canopy cover when added to already existing past harvest activities within the same vicinity (Megahan et al. 1978; Gray and Megahan 1981). There is a potential for cumulative effects on ~300 acres located downslope from units 26, 27, 32, and 33 around the western face of Hall Mountain.

For Alternatives 2 and 3, the proposed activities could also adversely impact slope stability on an estimated 150 acres around and below the eastern portions of Unit 38 leading into an unnamed tributary of Zion Creek. The activity area is located above potentially unstable slopes containing compacted tills. FR2211 and FR272 dissect the unit and could contribute to cumulative effects by influencing slope stability on site and downslope as soil water may increase as a result of proposed logging within Unit 38. No new roads are proposed in this area.

The remaining past harvest activities in the proposed project area that are not spatially associated with any of the proposed harvest units (i.e. downslope or upslope) were identified as stable or not relevant to having a cumulative effect.

Effects of Roads

The Mission Brush project is expected to have short-term road related impacts, especially sediment yield, followed by long-term improvements. Under Alternatives 2 and 4, the short-term impacts would primarily originate from a potential in increased sediment yield resulting from 5 miles of temporary road construction and decommissioning and soil restoration on skid trails in Unit 16. Under all alternatives, 13 miles of decommissioning and culvert removals on existing roads are proposed. Road improvements are proposed under all alternatives (39 miles under Alt. 2; 37 miles under Alt. 3; and 26 miles under Alt. 4) with activities being geared towards an overall net improvement of watershed conditions. A comprehensive evaluation on cumulative effects of the remaining road system can be found in the auqatics section.

Effects of Prescribed Burning and Slash Disposal

If soil moisture content is ≥25% when the burning occurs, measurable negative effects on soils are small. Fire should not be eliminated as an ecological process and proper management through fuel reduction and prescribed burning should sustain a future environment were fire is integrated and soil damage is minimal. Mitigation of potential fire effects through fuel treatments would eliminate the chance of detrimental effects to soil productivity and would add no additional impact to the project area. There would be minor short-term amounts of soil disturbance from manual fire line construction.

Effects of Activities on Coarse Woody Debris, Organic Matter, and Soil Productivity

The proposed vegetation and fuel treatment activities are expected to remove site nutrients with the harvest of tree boles on approximately 3900 acres for Alternative 2, 3325 acres for Alternative 3, and 2937 acres for Alternative 4. Certain nutrients, particularly potassium, are known to be critical for tree resistance to insects (Garrison-Johnston et al. 2003) and disease, especially root-rotting organisms (Garrison and Moore 1998). Maintenance of sufficient nutrient capital will be provided by retaining coarse woody debris (Brown et al. 2003; Graham et al. 1994) and overwintering logging slash (Baker et al. 1989; Barber and Van Lear 1984; Edmonds 1987; Garrison and Moore, 1998; Laskowski et al. 1995 and Palviainen et al. 2003).

Under all alternatives, whole-tree yarding is proposed on ~40 acres along the Forest Service boundary below Hall Mountain. Alternatives 2 and 4 would remove whole trees on an additional 14 acres in Unit 12 (though some tops will be retained),

therefore potentially reducing organic matter and nutrient levels below those of the surrounding area. In the event of a severe fire, cumulative effects from the already further depleted site are possible and may negatively influence soil productivity and extend recovery time. Effects on soil productivity from these activities are site specific attributes of the land on which they occur.

i. Consistency with the Forest Plan and Other Regulatory Direction

The action alternative would comply with Forest Plan Standards and the Regional Soil Quality Standards (FSM R1 Supplement 2500-99-1) related to detrimentally disturbed soils.

IPNF Forest Plan Standards

- Proposed soil disturbing management practices, including system roads, would impact up to 17% of the total activity area, which complies with the Forest Plan Standard requiring greater than 80% of an activity area to remain at an acceptable productivity potential.
- The Regional guidance to follow coarse woody debris recommendations of Graham et al. (1994) would adhere to the Forest Plan Standard to sustain sufficient microorganism populations to maintain site productivity.
- Provisions to maintain sufficient nutrient capital would be made in areas of whole-tree logging.
- Management area direction to implement Best Management Practices would be included in the proposed action.

Regional Manual Recommendations

- Proposed management activities would not exceed the recommended 15% for all but one individual activity area. The activity area where more than 15% detrimental soil condition exists from prior activities, the cumulative detrimental effects from project implementation and restoration should not exceed the conditions prior to the planned activity and would move towards a net improvement in soil quality.
- Fine organic matter layer thickness would be retained as appropriate for local conditions.
- Large woody debris would be maintained at recommended volumes (Graham et al. 1994) in each proposed activity area.

Features Designed to Protect Soil and Site Productivity

The following practices are designed to minimize the detrimental impacts of soil compaction, displacement, severe burning, and nutrient and organic matter depletion on long-term soil productivity. The use of these practices would ensure that the soil quality standards listed in the Forest Plan and Regional Soil Quality Standards would be met. Best Management Practices (BMPs) related to soil and sediment processes also apply and are outlined in "Features Designed to Protect Water and Aquatic Habitat" and Appendix E.

a. Ground-based Yarding:

- Where present, existing skid trails would be used.
- All new skid trails would be designated and approved prior to harvesting to take advantage of topography and minimize disruption of natural drainage patterns.
- Where terrain is conducive, trails would be spaced at least 100 feet or more apart.
- The use of a slash mat is recommended.
- Excavated skid trails will be obliterated, re-contoured, and covered with debris by the purchaser following completion of logging activities.
- All skid trails will be seeded and fertilized with the latest seed mix recommended at time of implementation.

***Estimated Effectiveness*:** High - These guidelines exceed the requirement of the Idaho Forest Practices Act and meet the Forest and Regional Soil Quality Standard by limiting disturbance to less than 15% of the activity area (Adams 1997; Niehoff 2002).

b. Protection of soils within specific stands –

Existing skid trails and slash mats will be used in Unit 16 to reduce additional impacts from harvest and site preparation activities.

***Estimated Effectiveness*:** High - past Forest Plan monitoring reports and literature (Han 2005; USDA 1998, 1999, 2000, and 2001) indicate little to no detrimental soil compaction and displacement with these requirements.

c. Protection during Winter Logging Activities –

One or more of the following requirements apply on all acres of winter ground-based logging:

- Operate on a 24-inch snow layer or 18 inches of settled snow.
- Require frozen ground to a depth of 4 inches.
- Restrict equipment operation to skid trails or where adequate slash matting exists.

Units 38, 57, and 62 would be harvested under winter conditions. Alternatively, a skyline system could be used during any season because of its low impacts to the soil resource.

Estimated Effectiveness: High - past Forest Plan monitoring reports and literature (USDA Forest Service 2001, 2002 and 2003; Flatten 2003; Philipek 1985) indicate little to no detrimental soil compaction and displacement with these requirements.

d. Skyline Yarding –
The leading end of logs would be suspended during yarding. Yarding across any designated RHCA would require full suspension. Designated corridors are required.
Estimated Effectiveness: High - the intent is to reduce the potential detrimental soil impacts of displacement and compaction. Past Forest Plan monitoring (Niehoff 2002; USDA Forest Service 2004) indicates low amounts of soil compaction and displacement with skyline yarding systems.

e. Net-improvement of Soils –
Unit 16 currently exceeds soil quality standards because of past harvest impacts. The timber sale contract would require the purchaser to rehabilitate the skid trails / rutting and, thereby, move toward a net improvement in soil quality. This would be accomplished through decompaction, addition of organic matter, seeding, and weed control. Funding to rehabilitate those skid trails outside Unit 16 would come from KV or other sources.
Estimated Effectiveness: Low to moderate - Decompaction would provide for improvements in hydrologic function and would initiate a recovery process that otherwise may be prolonged as soil compaction from past and proposed harvest activity persist (Froehlich 1984; Froehlich and Miles 1984; Heninger et al. 2002; Luce 1997; USDA Forest Service unpublished report 2005).

f. Temporary Road Construction –
An engineer or hydrologist would review locations of all roads longer than 300 feet prior to construction. When applicable, temporary road construction proposed would utilize the existing roadbed and would return the road to no less than the present conditions after harvest activities are concluded. In areas were current improvements would be advantageous (i.e. minor slumping where culverts have been pulled), the road would be further stabilized to reduce adverse effects.
Estimated Effectiveness: High - road location, particularly relative to streams, is a key factor in reducing road-related surface erosion at the scale of individual road segments. This feature would be implemented through contract provisions, administration of contract provisions, use of best management practices, and compliance monitoring by the sale administrator or engineering representative (Lynch and Corbett 1990; USDA Forest Service 1999c).

g. Nutrient Protection –
The latest soil nutrient management recommendations from the Intermountain Forest and Tree Nutrient Cooperative (IFTNC) and Rocky Mountain Research Station would be applied to each activity area where organic material is removed. As appropriate:

- Conventional removal (lop and scatter) rather than whole-tree removal would be practiced. The “lop and scatter” technique would be used during intermediate (thinning) as well as final harvest (regeneration) operations.
- Slash would remain on site over-winter so that mobile nutrients such as potassium can leach from fine materials back to the soil.
- Broadcast burn or underburns would be “light” in nature.
- Tree species suitable to the site would be planted.

Estimated Effectiveness: High to moderate - these practices are based on research and Intermountain Forest Tree Nutrition Cooperative recommendations (Baker 1989; Barber and Van Lear 1984; Edmonds 1987; Garrison and Moore 1998; Laskowski et al. 1995; Moore et al. 2004; Palviainen et al. 2004).

***h.* Retention of Coarse Woody Debris –**
Management of coarse woody debris and organic matter in all units would follow the USFS Region 1 guidelines described in the following table. In units where existing coarse material is not sufficient, project activities would provide enough dispersed dead and downed coarse material to meet the guidelines. Additional attention will be given to the whole-tree yarded Unit 12 and the ~40 acres along the Forest Service boundary to private land (affecting Units 28, 30, 31, and 32) to meet or exceed recommended guidelines in Graham et al. (1994).
***Estimated Effectiveness*:** High - based on research (Graham et al. 1994, Brown et al. 2003) and Forest Plan Monitoring Reports (USDA 1998, 1999, and 2000), effectiveness is high when guidelines are used; implementation has been moderately successful.

Table A-10. Coarse woody debris requirements (Graham et al. 1994)

Stands	Habitat Type	Coarse Woody Debris[1]
Douglas-fir/ninebark	PSME/PHMA	5-10 tons/acre
Grand fir/bear grass	ABGR/XETE	7-14 tons/acre
Western hemlock/queen cup beadlily	TSHE/CLUN	17-33 tons/acre

i. Protection During Grapple Piling, Excavator Piling, or Mechanical Harvest Activities –
Grapple piling, excavator piling, and ground-based yarding or harvester equipment would operate on a slash mat and existing skid trails on slopes under 35%.
Estimated Effectiveness: High - past Forest Plan monitoring and research (Han 2005; USDA Forest Service 2001, 2002, and 2003; Niehoff 2002) indicates little to no soil disturbance if equipment is operated on a slash mat.

j. Service Landings –
All landings will be located on system roads or in existing landings. Appropriate BMPs would be in place to prevent or reduce the amount of pollution generated from non-point sources. Weed treatment of sites would take place prior to logging activities. All other weed mitigation measures and prevention practices would occur in accordance with the requirements of the Bonners Ferry Noxious Weed EIS (1998). Following completion of harvest operations, all exposed soils will be seeded and fertilized.
Estimated Effectiveness: High – locating landings on existing classified National Forest system roads that are considered designated lands eliminates additional impacts to activity units. BMPs are very effective in reducing non-point source pollution from silvicultural activities (Lynch and Corbett 1998 and 1999). Effectiveness of weed mitigation practices are described in "Features Designed to Prevent the Spread of Noxious Weeds".

k. Protection During Prescribed Burning Activities –
Prescribed underburning, pile burning, and ecosystem burning would take place only when the upper surface inch of mineral soil has a soil moisture content of 25 percent when soil moisture would not result in a severe burn that could produce hydrophobic soils or eliminate the entire soil duff layer.
Estimated Effectiveness: High - this practice is effective in retaining decomposing forest floor litter and organic matter to retain nutrients and soil productivity potential (Niehoff 1985; Niehoff 2002; USDA Forest Service 2001, 2002 and 2003).

l. Nutrient Protection on Machine or Hand-Piled Areas –
Fine residue (foliage and branches) would be left on-site over the winter to allow potassium to leach out of these materials. Piling would occur the following spring, summer, or fall. Burn piles should be small and numerous rather than large and few.
***Estimated Effectiveness*:** High - this practice is based on research and Intermountain Forest Tree Nutrition Cooperative recommendations (Baker 1989; Barber and Van Lear 1984; Edmonds 1987; Garrison and Moore 1998; Laskowski et al. 1998; Moore et al. 2004; Palviainen et al. 2003).

m. Protection of Soils from Weed Infestation –
Weed mitigation measures and prevention practices would occur in accordance with the requirements of the Bonners Ferry Noxious Weed EIS for all landings, helicopter pads, and road disturbances.
Estimated Effectiveness: Moderate to High – Mitigation measures are accepted weed prevention practices developed by public land management agencies and university cooperative extension offices and promoted by weed management organizations across the nation (Drlik et al. 1998; Sheley et al. 2002; USDA FS 2001a). Effectiveness of weed mitigation practices are described in more detail in "Features Designed to Prevent the Spread of Noxious Weeds".

Monitoring

Unit 16 will be monitored post-harvest to assess if mitigation objectives were met.

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Appendix B -- Wildlife, Fisheries, Sensitive Plants, Invasive Species

B.1 Introduction

This appendix discusses resource issues and concerns that did not drive development of additional alternatives or that were addressed through design features and mitigation measures described in Chapter 2. Background and supporting documentation for some resources is placed here to facilitate ease of reading in the main body of the EIS. The following resources are covered in this appendix:

- Map of Lynx Analysis Unit
- Map of Grizzly Bear Deer Ridge Occupancy Area
- Wildlife Species Not Analyzed in Detail
- Fisheries Summary of Effects
- Sensitive Plants Report
- Invasive Species (Noxious Weeds) Report

Figure B-1 displays the habitat components within the Canada lynx analysis cumulative effects area for the Mission Brush EIS. Refer to Chapters 2, 3 and 4 for detailed Canada lynx discussions.

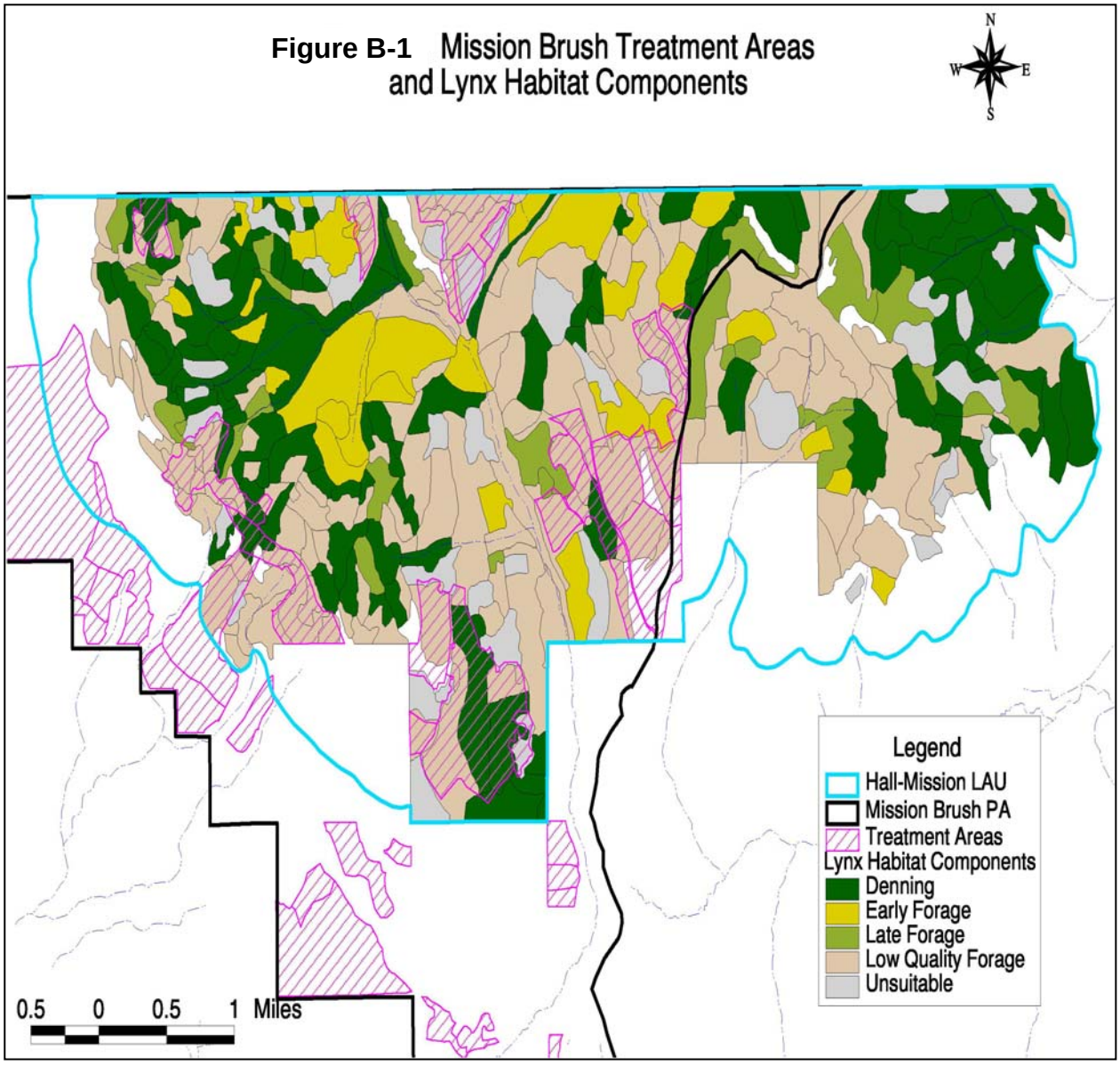
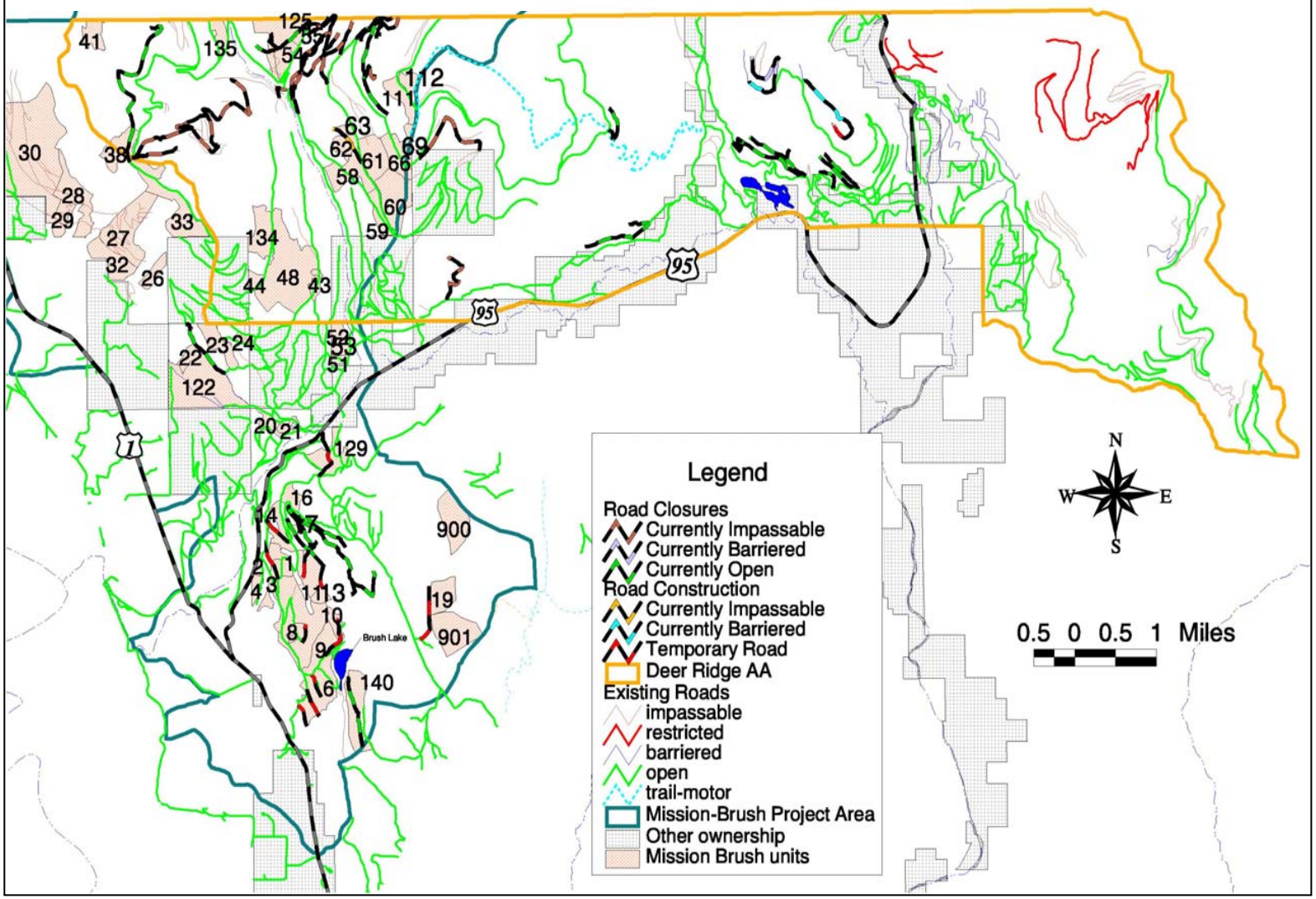


Figure B-1 Mission Brush Treatment Areas and Lynx Habitat Components

Figure B-2 displays the Grizzly Bear Deer Ridge Occupancy Area as well as the adjacent Mission Brush Proposed Treatment Units and Road Treatments. See Chapters 2, 3, and 4 for detailed discussion of grizzly bear.

Figure B-2. Mission Brush Treatment Units, Road Treatments and Deer Ridge Occupancy Area



B.2 Wildlife Species Not Analyzed in Detail

A preliminary analysis was conducted for each potentially affected wildlife species and their habitat to determine the scope of analysis. The following species or their habitat may exist in the Mission Brush project area, but are affected at a level that does not increase risk to the species, or effects can be adequately mitigated by altering the design of the project (see "Design Criteria", Chapter 2). For these reasons, these species were not analyzed in detail. Preliminary analysis information common loon, fringed myotis, pygmy nuthatch, Townsend's big-eared bat, North American wolverine, Coeur d'Alene salamander, and American marten are included in this appendix; information for the other species not analyzed in detail is located in the Wildlife section of the project file.

Table B-1. Species Not Analyzed in Detail

Species	Rationale for Elimination from Detailed Analysis	Preferred Habitat
Threatened and Endangered Species		
Woodland Caribou (*Rangifer tarandus caribou*)	The project area is outside of recognized caribou habitat. No recent sightings of caribou in project area. (See project file documentation.)	Above 4,000 ft. in Engelmann spruce/subalpine fir and western red cedar/western hemlock forests.
Bald Eagle (*Haliaeetus leucocephalus*)	No known nests or winter roosts within the project area. (See project file documentation.)	Normally nest and forage near large bodies of water. Winter visitors and yearlong residents of northern Idaho.
Sensitive Species		
American Peregrine Falcon *(Falco peregrinus anatum)*	No suitable habitat exists in the project area for this species. (See project file documentation.)	Open habitats near cliffs and mountains. Nesting cliffs near an adequate prey base.
Black Swift *(Cypseloides niger)*	No suitable habitat exists in the project area for this species. (See project file documentation.)	Builds nest behind or next to waterfalls and wet cliffs.
Common Loon *(Gavia immmer)*	Marginal nesting and foraging habitat. Activity areas buffered spatially and temporally.	Large, clear lakes below 5,000 ft. in elevation with at least a partially forested shoreline.
Fringed Myotis *(Myotis thysanodes)*	Suitable habitat is present in the project area for this species. Treated as a guild with flammulated owl.	Caves, mines, and abandoned buildings, large snag habitat.
Harlequin Duck *(Histrionicus histrionicus)*	No suitable habitat exists in the project area for this species. (See project file documentation.)	Shallow, swift streams in forested areas.
Pygmy Nuthatch *(Sitta pygmaea)*	Suitable habitat is present in the project area for this species. Treated as a guild with flammulated owl.	Ponderosa pine habitat, especially mature-old growth stands.
North American Wolverine *(Gulo gulo)*	No suitable denning habitat in the project area. No change in prey densities or increased access to remote areas.	Far-ranging omnivorous habitat generalist.
Northern Bog Lemming *(Synaptomys borealis)*	No suitable habitat exists in the project area for this species. (See project file documentation.)	Bogs, fens and, wet alpine and sub-alpine meadows.
Townsend's Big-eared Bat *(Corynorhinus townsendii)*	Suitable habitat (e.g. roosting, maternity, hibernation) is present within the project area, but activity areas spatially buffered.	Caves, mines, and abandoned buildings.
Coeur d'Alene Salamander *(Plethodon vandykei idahoensis)*	Suitable habitat exists in the project area for this species, but will be buffered from activity as necessary.	Springs, seeps, spray zones.
Management Indicator Species		
American Marten *(Martes americana)*	Suitable habitat is present in the project area for this species. Treated as a guild with fisher.	Variable mature confer stands with canopy closures greater than 40 percent with abundant large, down woody debris.

Species Habitats and Requirements

The following species or their habitat may exist in the Mission Brush project area, but are affected at a level that does not increase risk to the species, or effects can be adequately mitigated by altering the design of the project (see "Design Criteria", Chapter 2).

SENSITIVE SPECIES

a. Common Loon

Common loons generally nest in clear, fish-bearing lakes surrounded by forest, with Rocky shorelines, bays, islands, and floating bogs (McIntyre and Barr 1997). The species constructs ground nests on islands, floating bog islets, or other protected areas. Because of their need for large expanses of water for take off and landing, loons generally occur in lakes larger than 10 acres in size (USDA 1989).
The primary threats to loons are shoreline developments and recreational activities (i.e. boating, jet skiing) that interrupt nesting. Also, on some of the larger lakes such as Priest Lake and Lake Pend Oreille, these birds are extremely sensitive to human disturbance.

Reference Condition: Anecdotal evidence suggests, at least from a historical perspective, that common loons nested in northern Idaho. In 1985 a statewide effort was conducted to document loon distribution in Idaho (Fitch and Trost 1985). Lakes investigated were chosen using guidelines on size and elevation of lakes, water depth and clarity and nest and nursery habitat requirements. During this survey, the only successful nest discovered was at Indian Lake, south the Yellowstone Park, where one chick was fledged (however, nine-tenths of this lake resides in Wyoming). While there was no direct evidence of nesting in northern Idaho, loons were observed on several lakes including Robinson and Kerr lakes in Boundary County. Since this study shoreline development and the amount of boating traffic have increased dramatically on most North Idaho lakes with public access.

Existing Condition: Brush Lake is the only lake within the project area where the presence of loons might be expected, but it was not a selected site to be surveyed during the 1985 investigation. In 2001, surveys were conducted on ten lakes in northern Idaho between mid-May and mid-June to identify common loon nesting territories, including Brush Lake. These same lakes were resurveyed in September, 2004 to assess the availability of loon breeding habitat (Savoy 2005). No loons were observed on Brush Lake during either survey. However, a pair of loons was observed on the lake in June, 2003.

Rationale for No Further Analysis: Brush Lake is a relatively small lake with public access and is generally inadequate with regard to protected bays and islands. The lake contains only an isolated area of marginal nesting habitat (Savoy 2005). Public use is primarily camping and boating. Loons are extremely sensitive to disturbance during the breeding season, and boating and other human activities on potential nesting lakes are presumably the major cause for their decline (Fitch and Trost 1985). Brush Lake is regarded as only marginally suitable for loon nesting due to the lack of historical evidence of nesting and protected bays or islands, and escalating human use. In addition, Brush Lake is stocked annually with catchable-sized trout. There is a little spawning habitat in this lake, and although fingerlings and fry are occasionally stocked, Brush Lake generally lacks the fingerling-sized fish loons prefer as prey items. Several proposed harvest units are adjacent to Brush Lake, but INFISH buffers (300') and timing restrictions (winter harvest) will mitigate any potential impacts to common loons. Therefore the Mission Brush project would have no impact on the common loon. No further discussion or analysis is necessary.

b. Pygmy Nuthatch

The pygmy nuthatch is a sedentary, year round resident of ponderosa pine forests (Ghalambor 2003). It relies heavily on the foliage of live, larger ponderosa pines as foraging habitat and on larger ponderosa pine snags for nesting and roosting cavities (McEllin 1979). Their almost exclusive association with ponderosa pine, particularly mature stands that are fairly open (<70% canopy closure), leads to a patchy distribution of the pygmy nuthatch as they mirror ponderosa pine's distribution (Kingery and Ghalambor 2001, Engle and Harris 2001). Pygmy nuthatch abundance is directly correlated with snag density and foliage volume (Ghalambor 2003). They generally excavate their own nest cavity, but at times are a secondary cavity nester and locate their nest cavities in dead trees or in dead sections of live trees (Ghalambor 2003). Their diet consists mainly of insects during the breeding season, and in some areas they forage almost exclusively on pine seeds in the non-breeding season (Ghalambor 2003).

Reference Condition: The main threats to the species are the loss of ponderosa pine dominated forests and low snag densities (Ghalambor 2003). There has been a substantial decline of mature ponderosa pine forests in recent years (Wisdom et al. 2000). This decline is largely due to fire suppression, which has replaced natural regimens of frequent, low intensity fires that

maintained relatively open ponderosa stands and has allowed for a marked increase in the density of shade-tolerant tree species (i.e. Douglas-fir), thereby reducing the availability of habitat for the pygmy nuthatch. The encroaching shade tolerant species are also shorter-lived and more susceptible to insect and disease, increasing the amount of ladder fuels and the probability of a stand-replacing fire, which again could lead to the loss of mature ponderosa pine habitat (Wisdom et al. 2000). In addition, studies have shown that reduction of the number of snags greatly diminishes pygmy nuthatch densities by decreasing the availability of suitable nest and roost cavities (Balda et al. 1983, Scott 1979).

Existing Condition: Pygmy nuthatches have not been documented on the Bonners Ferry Ranger District, but to date no surveys have been undertaken by the USFS specifically for this species. Due to the presence of potnetially suitable habitat, their presence is assumed for this analysis.

Rationale for No Further Analysis: Because of habitat similarities between the two species, pygmy nuthatch can be treated as a guild with flammulated owl. The project effects to this species are represented by the effects analysis for flammulated owls.

c. Fringed Myotis

The fringed myotis is a member of the group of bats referred to as the "long-eared" bats. Except for ear size, it is larger than most other bats in this group (approximately 3½ inches in total length) and is identified by a distinct fringe of hair along the tail membrane (Keinath 2004, Montana Fish, Wildlife and Parks 2004). Fringed myotis use a fairly broad range of habitats represented by open areas (e.g. grasslands) interspersed with mature forests (usually ponderosa pine, pinyon-juniper or oak) at middle elevations that contain suitable roosts sites and are near water sources (Keinath 2004). They are relatively slow but highly maneuverable flyers, and are most active the first two hours following sunset (O'Farrell and Studier 1980). Fringed myotis feed on insects during flight and glean insects off of vegetation, usually near the top of the forest canopy, with beetles and moths making up the majority of their diet (Keller 2000, O'Farrell and Studier 1980, Wisdom et al. 2000).

Where available, fringed myotis use caves, mines, buildings and rock crevices as day, night, maternity and hibernation roosts sites (Ellison et al. 2004). They also roost underneath the bark and inside hollows of snags, particularly larger ponderosa pine and Douglas-fir snags in medium stages of decay (O'Farrell and Studier 1980, Rabe et al. 1998, Weller and Zabel 2001, Rasheed et al. 1995). Generally, snags used as roost sites are in somewhat open microsites within otherwise contiguous forest (Weller and Zabel 2001, Vanhof 1995). Because of the short lifespan of snags, bats using snags to roost require a high density of snags and often move between snags while roosting (Weller and Zabel 2001, Rabe et al. 1998). The area used by fringed myotis varies substantially based on the location of water sources, foraging areas (which fluctuates with insect abundance) and appropriate roost sites. However, it is thought that these habitat components need to occur within roughly ½ mile to 2 ½ miles of each other in a configuration that minimizes total commuting time (Keinath 2004).

Reference Condition: The main risks to fringed myotis are the loss of suitable habitat for foraging or roosting and human disturbance of roost sites. Fringed myotis, like many bat species, are very sensitive to disturbance or habitat modification and any change in conditions altering the microclimate (e.g. airflow, thermal regime) close to roosts can have a substantial impact (Keinath 2004). Fringed myotis are perhaps more vulnerable to alterations of mature or old growth forest conditions than most bat species because of their close association with these forests that contain abundant, large snags for roosting (Keinath 2004). According to Rabe et al. (1998), the use of multiple snags by roosting bats and the short-term nature of snags in the early decompositional stages of decay suggest that bats require higher densities of snags than birds. Tree harvest can also affect bats by potentially reducing foraging areas, as insect prey tends to concentrate just above the canopy and along forested edges, and can also impact the thermal properties of the remaining forest. In addition, riparian areas should be managed to retain natural stream hydrology and healthy riparian vegetation to allow for sufficient water sources and to promote use by emergent insects. Therefore, management activities should, 1) manage for the retention and recruitment of large diameter snags at relatively high densities, particularly in late-successional forests; 2) protect known roost sites to prevent human disturbance or habitat alteration of microsite conditions, and; 3) maintain and improve riparian areas (Wisdom et al. 2000). Existing conservation strategies for Townsend's big-eared bats and old growth management policies both provide guidance that affords some level of protection for the fringed myotis and their habitat requirements.

Existing Condition: There are no known occurrences of fringed myotis within the project area. There are two known abandoned mines (American Girl mine and Bethlehem mine complex) and one active claim (Montgomery mine complex) in the assessment area. Multiple surveys of both abandoned claims between 1998 and 2002 documented the presence of Townsend's big-eared bats and unidentified Myotis species (although likely not fringed myotis). The Montgomery mine complex was surveyed in 1997, documenting evidence of bat use around the entrance, but no evidence of roosting. There is also a small abandoned building at this site, but a cursory investigation in 2002 did not reveal any obvious signs of bat use.

The Townsend's big-eared bat conservation strategy (Pierson et al. 1999) suggests a 0.25 mile radius "no activity" buffer be established around known maternity roosts and hibernacula during critical time periods. There are no proposed units within

0.25 miles of the American Girl mine, and the boundaries of a proposed burn in the vicinity of the Bethlehem mine complex have been adjusted to provide a 0.25 mile buffer. There are portions of two harvest units within 0.25 miles of the Montgomery mine complex, but there is no evidence of roosting bats at this site. The abandoned shack and mine itself may provide habitat, as may the mature dry forest stand immediately upslope. However, since this claim remains active, there is occasional activity both in and around the mine. Due to this intermittent disturbance, it is unlikely that this mine is relied upon as a maternity roost or hibernacula.

Rationale for No Further Analysis: Because of their association with mature and old-growth dry site forests, fringed myotis can be treated as a guild with flammulated owl. The project effects to this species are represented by the effects analysis for flammulated owls. No further analysis and discussion is warranted.

d. Townsend's Big-Eared Bat

Townsend's big-eared bats are primarily cave dwelling species. Although they occur in a wide variety of habitats, distribution tends to be correlated with the availability of caves, especially old mine workings (Pierson et al. 1999). Their behavior appears, in most cases, to be temperature driven with bats using cooler sites before the young are born and moving to warmer sites after the young are born. In spring and summer, females form maternity colonies in warm parts of caves, mines and buildings. In winter, they prefer relatively cool places for hibernation, often near entrances and in well-ventilated parts of caves and mines (Kunz and Martin 1982).

Reference Condition: Townsend's big-eared bats occur throughout much of the western North America, from British Columbia to Mexico, and eastward to Texas (Pierson et al. 1999). Throughout much of their range they are recognized as species at risk. They are currently listed as a R-1 Sensitive Species and considered species of special concern by most western states' wildlife management agencies. Records of Townsend's are found throughout the State of Idaho.

The most serious factor leading to population declines is loss and/or disturbance of suitable roosting habitat. The most notable threats include abandoned mine closures, recreational caving, and renewed mining at historical sites (Pierson et al. 1999).

Existing Condition: Within the affected area of the Mission Brush project there are two known abandoned mines (American Girl mine and Bethlehem mine complex) and one active claim (Montgomery mine complex). The American Girl mine was surveyed in 1999 and again in 2002. In 1999 six Myotis species were captured in a mist net. In 2002, while no bats were captured, night vision detected seven "visits". The Bethlehem mine complex was examined in 1998-2000 and 2002 documenting the presence of Townsend's big-eared bats along with Myotis species. The Montgomery mine complex was surveyed in 1997, documenting evidence of bat use around the entrance with no evidence of roosting.

Timber harvesting practices may impact both foraging and roosting habitat for bats. Impacts may range from temporary displacement to elimination of populations in those areas where alternate roost sites are unavailable. The Species Conservation Assessment and Conservation Strategy for the Townsend's Big-eared Bat (Pierson et al. 1999) suggests a 0.25 mile radius, "no activity" buffer be established around mines to avoid disturbance during critical periods (e.g. maternity roosts, hibernacula). Since Townsend's are known to use the area and it is inconclusive what the critical use periods are, "no-activity" buffers would be year round (see "Design Criteria", Chapter 2).

Rationale for No Further Analysis: While Townsend's big-eared bats may be present in the project area, the two most likely roost sites (Bethlehem and American Girl mines) will be buffered from all activity by at least ¼ mile. There are portions of two harvest units near the Montgomery mine complex, but there is no evidence of roosting bats at this site. Since this claim remains active, there is occasional activity both in and around the mine, and it is unlikely that it is relied upon as a maternity roost or hibernacula. As a result, the Mission Brush project would have no impact on Townsend's big-eared bats or their habitat. No further analysis and discussion is necessary.

e. North American Wolverine

Wolverines are low density, wide-ranging species that are found in a variety of open and forested habitats at all elevations, usually associated with remote mountain areas. They are generally described as opportunistic omnivores; traveling long distances for their daily hunting. Preferences for some forest cover types, aspects, slopes or elevations have been primarily attributed to food abundance (Ruggiero et al. 1994). An important feature of their habitat is high elevation cirque basins that provide reproductive security and year-round foraging, especially for females.

Primary risk factors that can threaten local population viability of the species include reduction of wilderness "refugia" through access and management practices that degrade the presence and opportunity for food availability (Copeland 1996). Ruggiero et al. (1994) showed through previous studies that the availability of large mammals and large mammal carrion is paramount

importance to the distribution, survival and reproductive success of wolverines. Also, the protection of reproductive denning habitat seems to be critical for the persistence of wolverine.

When viewed in conjunction with potential displacement and disturbance by winter recreational activities, denning habitat may be a limited and critical component of wolverine habitat (Copeland 1996). A recent study in Idaho found that wolverine selected den sites associated with large boulder talus in high elevation, subalpine cirque basins (Copeland 1996).

Reference Condition: Wolverines are considered scarce or rare in north Idaho, however, the actual status and range remains uncertain. The scarcity of information is largely due to the difficulty and expense in studying an animal that is solitary and secretive, and found mostly in remote areas. Occasional observations have been reported and tracks documented in recent decades.

Existing Condition: While little information exists on wolverine distribution in northern Idaho, in the fall of 2001 a wolverine was observed near Bethlehem Mountain, in the southern portion of the project area.

As is the case with other forest carnivores, wolverines require large, remote areas to roam and feed. The proposed actions are located in the developed (roaded) portion of the project area, in an environment that makes wolverine presence untenable or undesirable. While a wolverine was observed in the southern portion of the project area in 2001, this observation is located on the fringe or periphery of a large block of undeveloped ground to the east of the project area.

There are no high elevation cirque basins or potential denning habitat within the evaluation area. Consequently, the risk of disturbance and potential displacement by winter recreational activities in the project area would not be a factor. The proposed recreational developments in the Brush Lake area would have little or no impact upon wolverines because enhanced off-road recreational opportunities would occur in a highly developed portion of the District - an unattractive area to wolverines. The undeveloped area to the east of the project area does not receive a high amount of snowmobile use – mostly along existing roads on the northern and eastern periphery - due to the high percentage of dense canopy cover forest. The planned enhancements in the Brush Lake area would not noticeably improve snowmobile access to this area. Snowmobile access is mainly from Hellroaring Creek to the north, as low elevation makes snow depths near Brush Lake shallow and unreliable. Subsequently, none of the features of the proposed action are likely to increase snowmobile use in the vicinity of Brush Lake or adjacent areas.

Rationale for No Further Analysis: Access would remain unchanged, so the chance of human/wolverine interactions and subsequent mortality risk would remain the same. Ungulate populations are at or near all time highs (Compton 1999), so foraging habitat does not appear to be limiting to wolverines. Based on these factors, this project would have no impact on wolverines or their habitat. No further analysis and discussion is necessary.

f. Coeur d'Alene Salamander

Coeur d'Alene salamanders are small salamanders that choose seeps and wet sites, usually with rock that contains deep fissures that enable them to moderate their temperature by avoiding outside air. Known populations occur in association with fractured rock formations often found in the Belt rock formations. They have been found in three types of select habitats: seeps and springs, waterfall spray zones, and stream edges (Groves and et al. 1996). Coeur d'Alene salamanders are usually found above ground at night during moist weather in the spring and fall and retreat into the narrow spaces between fractured rocks to avoid drying out in the summer and freezing in the winter.

Reference Condition: Coeur d'Alene salamanders are found in scattered locations through the Idaho Panhandle National Forests. This species occurs on Bonners Ferry Ranger District on the east side, but has not been recorded in the Selkirks because of inappropriate geology. Where it has been investigated, it has been found to be locally abundant but limited to appropriate microhabitats within its limited range.

Existing Condition: There are no known occurrences of Coeur d'Alene salamanders within the Mission Brush project area. Although suitable salamander habitat may be present (live stream edges and seeps/springs) within the planning area, impacts to these areas would be avoided through treatment area design and application of INFISH standards.

Rationale for No Further Analysis: Since design criteria would ensure that suitable habitat is excluded from proposed treatment areas, the Mission Brush project would have no impact on the Coeur d'Alene salamander or its habitat. No further analysis and discussion is necessary.

MANAGEMENT INDICATOR SPECIES

g. American Marten

The marten is a solitary carnivore that inhabits mature stands of coniferous forest throughout North America. In the western United States, marten are most abundant in mature to old growth true fir or spruce-fir forests and generally avoid open, drier coniferous forests (Warren 1990). They prefer forest stands greater than 40 percent tree canopy closure, which protects them from predators and enhances the moist conditions favorable for prey species (Clark et al. 1989).

American marten was selected by the Idaho Panhandle Forest Plan as a management indicator species. It represents species using mature and old-growth habitats. In addition to a closed canopy, marten require an abundance of large downed logs and snags. These provide secure resting locations, denning habitat and winter access to small mammals living beneath the snow (Patton and Escano 1990). American marten are easily trapped and are highly vulnerable to overharvest in areas accessible by fur trappers.

Rationale for No Further Analysis: Although the presence of marten has not been documented in the project area, anecdotal evidence suggests that marten are common and widespread throughout the District. Because of habitat similarities with fisher, the American marten will be treated as a guild in this document with fisher. Therefore, this species will not be further analyzed in this document.

h. Snag Habitat

Snags, or standing dead trees, are vital components of the forest ecosystem. In the Interior Columbia River basin they provide habitat for more than 80 species of birds, mammals, reptiles, and amphibians and play a critical function in long-term site productivity (Bull et al. 1997). Many forest-dwelling animals use these structures for nesting, foraging, denning and roosting.

Most notable users of this habitat are primary excavators, such as hairy woodpeckers and Northern flickers, which create cavities in decaying wood of standing trees. These cavities are subsequently used by other wildlife species once the primary excavators have abandoned them (Bull et al. 1997). Fallen snags or dead and down woody material have important ecological functions including nutrient cycling, nitrogen fixation, and wildlife habitat.

Historically, ecosystems in north Idaho were shaped by disturbance patterns that altered the size and distribution of forest structure across the landscape. Forest succession, wind damage, fire, insects and disease created snags in areas that ranged in size from individual trees or small patches to entire drainages. Consequently, snag densities vary across the landscape, from areas with low densities to other areas with high densities.
Snag habitat associated with the Mission Brush project area has been strongly influenced by fire and the subsequent changes in vegetation composition. The severe fires of the 1800s left much of the landscape in early stages of forest development. A large lethal and mixed-severity fire in the 1850s probably left a lot of snags across the landscape. This change in condition likely increased, temporarily, the breeding densities of black-backed woodpeckers.

Although this stand-replacing fire provided a pulse of hard snags, it disrupted the continuity and sustainability of snag production that would occur during the predicted sequence of vegetation change. Because most snags generally do not persist long after a catastrophic fire, black-backed woodpecker populations probably dispersed from the burn areas within several years following the fire. Morrison and Raphael (1993) found that snags created by fire fell sooner than non-fire-created snags. Burning at their base probably weakens snags created by fire. Also, snags in large burned areas are directly exposed to wind, causing them to fall sooner than snags surrounded by live trees. In addition, subsequent large-scale fires likely consumed most of the remaining snags on the landscape.

Rationale for No Further Analysis: Design features of the project were devised to ensure the retention and selection of snags at a level and distribution to support viable populations of species that use snags and logs. Snags and snag replacements would be retained in all treatment units at levels recommended by the Region 1 Snag Management Protocol. The Snag Protocol recognizes that not all stands are able to meet snag guidelines, but that the overall goal is to provide adequate snag habitat over the landscape. Snag retention objectives exceed Forest Plans standards and snag retention levels developed by Thomas et al. (1979).

Potential effects to snag habitat will be addressed in detail in analysis of effects upon snag-dependent species (black-backed woodpecker, pileated woodpecker, flammulated owl, northern goshawk and fisher).

B.3 Fish - Threatened Endangered and Sensitive Species

Determination of Effects
The following discussions and tables summarize the effects on federally listed and sensitive species.

a. White Sturgeon
White sturgeon are not found outside of the mainstem Kootenai River, which is outside of the cumulative effects area for this project.

b. Bull Trout
No Bull trout have been found in streams within the cumulative effects area of this project, including Mission, Zion, or Brush Creeks. The habitat is connected to the Kootenai River; however, the lower 3 km of Mission Creek has been channelized, likely resulting in a thermal barrier to fluvial bull trout migration from the Kootenai River.

c. Westslope Cutthroat Trout
Cutthroat trout have been identified in Mission Creek, both above and below the falls. West slope cutthroat trout were stocked in Brush Lake in the 1990s and 2002 by Idaho Department of Fish and Game. Further information can be found in Chapters 3, 4 and the project file.

d. Torrent Sculpin
It is unknown if torrent sculpin inhabit the Mission Creek watershed; however, presence of torrent sculpin is unlikely due to the small size of the streams. Torrent sculpin prefer riffle habitat in medium to wide streams and rivers (Markle et al. 1996). Similar to westslope cutthroat and bull trout, the torrent sculpin is also a cold-water species and consequently its range overlaps with both these species. Analyzing effects on the westslope cutthroat trout will cover possible effects on this species.

e. Interior Redband Trout
It is unknown if interior redband trout inhabit the Mission Creek watershed; however, electrofishing surveys from 1996 failed to document their presence. Similar to westslope cutthroat and bull trout, the interior redband trout is also a cold-water species and consequently its range overlaps with both these species. Analyzing effects on the westslope cutthroat trout will cover possible effects on this species.

f. Burbot
Burbot are not found outside the mainstem Kootenai River, which is outside the cumulative effects area for this project.

Table B-2. Determination of Effects for Federally Listed Species

Endangered Species:	**Species or Habitat Present in Project Area**	**Species or Habitat Potentially Affected**	**Species Further Analyzed**	**Determination of Effects**
White sturgeon *Acipenser transmontanus*	No	No	No	No effect
Threatened Species:				
Bull trout *Salvelinus confluentus*	No	No	No	No effect

Sensitive Species:		**Determination of Effects**
Burbot *Lota lota*	No Effect	
Interior redband trout *Oncorhynchus mykiss gairdneri*	No Effect	
Westslope cutthroat trout *Oncorhynchus clarki lewisi*		May Impact Individuals, but Will Not Likely Result in a Trend Toward Federal Listing or Reduced Viability for the Population or Species
Torrent sculpin *Cottus rhotheus*		May Impact Individuals, but Will Not Likely Result in a Trend Toward Federal Listing or Reduced Viability for the Population or Species

(None of the proposed actions are considered significant actions)

INFS Standards and Guidelines
(USDA A-7 through A-13; 1995)

Only INFS standards and guidelines that apply to the range of alternatives for the Mission Brush Project are addressed here; those standard and guidelines that do not apply are in the INFS document located in the project file. These INFS standards and guidelines are addressed with comments in italics as follows:

Timber Management (A-7)

TM-1. Prohibit timber harvest, including fuelwood cutting, in Riparian Habitat Conservation Areas, except as described below.

- Where catastrophic events such as fire, flooding, volcanic, wind, or insect damage result in degraded riparian conditions, allow salvage and fuelwood cutting in Riparian Habitat Conservation Areas only where present and future woody debris needs are met, where cutting would not retard or prevent attainment of other Riparian Management Objectives, and where adverse effects can be avoided to inland native fish. For priority watersheds, complete watershed analysis prior to salvage cutting in RHCAs.

The RHCA for Brush Lake is degraded by offsite Ponderosa pine, and removal of these trees would not retard attainment of Riparian Management Objectives. Brush Lake is not a priority watershed.

- Apply silvicultural practices for Riparian Habitat Conservation Areas to acquire desired vegetation characteristics where needed to attain Riparian Management Objectives. Apply silvicultural practices in a manner that does not retard attainment of Riparian Management Objectives and that avoid adverse effects on inland native fish.

Removal of the offsite Ponderosa pine would promote stand vigor within the Brush Lake RHCA, and would not have any adverse effects on inland native fish.

Effectiveness: *High. No commercial harvest is to occur within the RHCAs.*

Roads Management (A-7and A-8)

RF-1. Cooperate with Federal, Tribal, State, and county agencies, and cost-share partners to achieve consistency in road design, operation, and maintenance necessary to attain Riparian Management Objectives.

The proposed activities are all on National Forest lands, but have been coordinated with all those listed where applicable.

Effectiveness: *High. This coordination is standard policy.*

RF-2. For each existing or planned road, meet the Riparian Management Objectives and avoid adverse effects to inland native fish by:

a. Completing watershed analyses prior to construction of new roads or landings in Riparian Habitat Conservation Areas (RHCAs) within priority watersheds.

This project area is not within an INFS priority watershed. However, no construction of new roads, temporary roads, or landings is proposed within RHCAs.

b. Minimizing road and landing locations in Riparian Habitat Conservation Areas.

No new roads or landings are proposed within RHCAs under any of the action alternatives.

Effectiveness: *High.*

c. Initiating development and implementation of a Road Management Plan or a Transportation Management Plan. At a minimum, address the following items in the plan:

1. Road design criteria, elements, and standards that govern construction and reconstruction.

2. Road management objectives for each road.
3. Criteria that govern road operation, maintenance, and management.
4. Requirements for pre-, during-, and post-storm inspections and maintenance
5. Regulation of traffic during wet periods to minimize erosion and sediment delivery and accomplish other objectives such as protection of the road surface.
6. Implementation and effectiveness monitoring plans for road stability, drainage, and erosion control.
7. Mitigation plans for road failures.

The interdisciplinary team (IDT) evaluated access and road improvement needs within the project area. The project includes spot gravelling to improve drainage on haul routes. (See Chapter 2 Tables 2-14 and 2-15 for additional information)

Effectiveness: *Moderate.*

d. Avoiding sediment delivery to streams from the road surface.

1. Outsloping of the roadway surface is preferred, except in cases where outsloping would increase sediment delivery to streams or where outsloping is unfeasible or unsafe.

This standard is applied directly for the proposed temporary roads.

Effectiveness: *High. Roads would be constructed with this design.*

2. Route road drainage away from potentially unstable stream channels and hillslopes.

Effectiveness: *High. Improved road drainage would be part of the road package. Water would be less concentrated below existing roads than at present.*

e. Avoiding disruption of natural hydrologic flow paths.

Roadwork associated with this project including road reconstruction and decommissioning will be completed.

Effectiveness: *High. Road reconstruction projects would restore the hydrologic flow paths.*

f. Avoid sidecasting of soils or snow. Sidecasting of road material is prohibited on road segments within or abutting RHCAs in priority watersheds.

There are no priority watersheds within the Mission Brush project area; however, sidecasting of snow and/or soils would be prohibited at all stream crossings.

RF-3. Determine the influence of each road on the Riparian Management Objectives. Meet Riparian Management Objectives and avoid adverse effects on inland native fish by:

a. Reconstructing road and drainage features that do not meet design criteria or operation and maintenance standards, or that have been shown to be less effective than designed for controlling sediment delivery, or that retard attainment of Riparian Management Objectives, or do not protect priority watersheds from increased sedimentation.

b. Prioritizing reconstruction based on the current and potential damage to inland native fish and their priority watersheds, the ecological value of the riparian resources affected, and the feasibility of options such as helicopter logging and road relocation out of Riparian Habitat Conservation Areas.

c. Closing and stabilizing; or obliterating and stabilizing; roads not needed for future management activities. Prioritize these actions based on the current and potential damage to inland native fish in priority watersheds, and the ecological value of the riparian resources affected.

The proposed road reconstruction and maintenance described in Chapters 2 and 3 originate from the above standards. The action alternatives would meet this standard.

Effectiveness: *High. Existing roads are proposed for reconstruction with the Timber Sale Contract, so the likelihood that the projects would be completed is high.*

RF-4. Construct new, and improve existing, culverts, bridges, and other stream crossings to accommodate a 100-year flood, including associated bed load and debris, where those improvements would/do pose a substantial risk to riparian conditions. Substantial risk improvements include those that do not meet design and operation maintenance criteria, or that have been shown to be less effective than designed for controlling erosion, or that retard attainment of Riparian Management Objectives, or that do not protect priority watersheds from increased sedimentation. Base priority for upgrading on risks in priority watersheds and the ecological value of the riparian resources affected. Construct and maintain crossings to prevent diversion of streamflow out of the channel and down the road in the event of crossing failure.

The proposed road crossing improvements originate from the above standard. The action alternatives would meet this standard.

Effectiveness: High. *There are no stream crossings for any of the temporary roads proposed under Alternatives B or D.*

RF-5. Provide and maintain fish passage at all road crossings of existing and potential fish-bearing streams.

Effectiveness: *High. There are currently no crossings that are known fish barriers in the project area.*

Fires/Fuels Management (A-11)

FM-1. Design fuel treatment and fire suppression strategies, practices, and actions so as not to prevent attainment of Riparian Management Objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management actions could perpetuate detrimental conditions, or be damaging to, long-term ecosystem function or inland native fish.

FM-2. Locate incident bases, camps, helibases, staging areas, helispots, and other centers for incident activities outside of Riparian Habitat Conservation Areas. If the only suitable location for such activities is within the Riparian Habitat Conservation Area, an exemption may be granted following a review and recommendation by a resource advisor. The advisor would prescribe the location, use conditions, and rehabilitation requirements, with avoidance of adverse effects to inland native fish a primary goal. Use an interdisciplinary team, including a fishery biologist, to predetermine incident base and helibase locations during presuppression planning.

FM-3. Avoid delivery of chemical retardant, foam, or additives to surface waters. An exception may be warranted in situations where overriding immediate safety imperatives exist, or, following a review and recommendation by a resource advisor and a fishery biologist, when the action agency determines that an escape fire would cause more long-term damage to fish habitats than chemical delivery to surface waters.

FM-4. Design prescribed burn projects and prescriptions to contribute to the attainment of the Riparian Management Objectives.

The proposed prescribed burn projects described in Chapters 2 and 3 originate from the above standards. The action alternatives would meet this standard.

Effectiveness: *High. Planting of long-lived tree species to provide for large woody debris recruitment would follow prescribed burning within the RHCAs.*

FM-5. Immediately establish an emergency team to develop a rehabilitation treatment plan to attain Riparian Management Objectives and avoid adverse effects on inland native fish whenever a wildfire or a prescribed fire burning out of prescription significantly damages Riparian Habitat Conservation Areas.

The proposed fires/fuels management described in Chapter 2, and 3 originate from the above standards. The action alternatives would meet this standard.

Effectiveness: Moderate to High. Prescribed fire in the project area is designed to meet these standards.

General Riparian Area Management (A-12)

RA-1. Identify and cooperate with Federal, Tribal, State and local governments to secure instream flows needed to maintain riparian resources, channel conditions, and aquatic habitat.

This project does not adversely affect instream flows.

RA-2. Trees may be felled in Riparian Habitat Conservation Areas when they pose a safety risk. Keep felled trees on site when needed to meet woody debris objectives.

The high-risk lodgepole pine trees in the RHCA are safety hazards to recreation users. Additionally, they are not needed to meet woody debris objectives in Brush Lake or Brush Creek.

RA-3. Apply herbicides, pesticides, and other toxicants, and other chemicals in a manner that does not retard or prevent attainment of Riparian Management Objectives and avoids adverse effects on inland native fish.

By following the BMPs listed in the Bonners Ferry Noxious Weed FEIS, all alternatives would meet this standard.

Effectiveness: High. Standards would be met as required by the Bonners Ferry Noxious Weed EIS.

RA-4. Prohibit storage of fuels and other toxicants within Riparian Habitat Conservation Areas. Prohibit refueling with Riparian Habitat Conservation Areas unless there are no other alternatives. The Forest Service must approve refueling sites within a Riparian Habitat Conservation Area or Bureau of Land Management and have an approved spill containment plan.

Effectiveness: High. This is a standard BMP that is part of the timber sale contract. (See Chapter 2, Section 2.8)

RA-5. Locate water-drafting sites to avoid adverse effects to inland native fish and instream flows, and in a manner that does not retard or prevent attainment of Riparian Management Objectives.

Effectiveness: Moderate. This standard would be applied in the prescribed burn plans associated with the Mission Brush project. However, wildfire suppression is beyond the scope of this project and water drafting associated with such an emergency would be addressed as a separate issue.

Watershed and Habitat Restoration (A-12)

WR-1. Design and implement watershed restoration projects in a manner that promotes the long-term ecological integrity of ecosystems, conserves the genetic integrity of native species, and contributes to attainment of Riparian Management Objectives.

Effectiveness: High. The proposed watershed restoration projects originate from the above standard. The action alternatives would meet this standard.

WR-2. Cooperate with Federal, State, local, and Tribal agencies, and private landowners to develop watershed-based Coordinated Resource Management Plans (CRMPs) or other cooperative agreements to meet Riparian Management Objectives.

Effectiveness: Moderate to High. Cooperation at the multiple levels as listed occurred within the framework for developing the proposed activities of this project.

Fisheries and Wildlife Restoration (A-13)

FW-1. Design and implement fish and wildlife habitat restoration and enhancement actions in a manner that contributes to attainment of the Riparian Management Objectives.

Effectiveness: High. Improvements to culverts, road decommissioning, and riparian planting are habitat enhancement actions that will be implemented in a manner that contributes to attainment of Riparian Management Objectives.

FW-4. Cooperate with Federal, Tribal, and State fish management agencies to identify and eliminate adverse effects on native fish associated with habitat manipulation, fish stocking, fish harvest, and poaching.

Cooperation at the multiple levels as listed occurred within the framework for developing the proposed activities of this project. Using the INFS Standard Widths Defining Interim RHCAs for the project activities, habitat manipulation does not apply. Fish stocking, harvest and/or poaching are all regulated by State management guidelines.

Effectiveness: High. Existing habitat would be preserved under this project.

Forest Plan Guidelines (USDA 1987, pp. II – 29-31)

Fry Emergence (Fish Standard 1 and 2):

Forest Plan Consistency (addressing the fry emergence standard)

On June 2, 2005, the Forest Supervisor for the Idaho Panhandle National Forests signed a Decision Notice and Finding of No Significant Impact that amended the Forest Plan to modify or remove objectives, standards, and monitoring requirements pertaining to fry emergence success (IPNF 2005). The amendment was implemented because the fry emergence objectives, standards and monitoring requirements that were in the IPNF Forest Plan did not contribute as well as INFISH objectives, standards, guidelines, and monitoring direction towards meeting the goals of providing sufficient habitat in support of maintaining diverse and viable populations of fish species across the forest. In addition, because of the limited application of the fry emergence models and their unreliability, and the inability to determine fry emergence success in the field due to high variability affected by multiple natural and human-caused factors, the Forest Service was not be able to state with any degree of certainty whether measures of fry emergence success were accurate or precise. (IPNF 2005. Fry Emergence Amendment Decision Notice and Finding of No Significant Impact. 70 pages.)

Fish Standard 3: The stream and river segments (if listed) will be managed as low access fishing opportunities to maintain a diversity of fishing experiences for the public and to protect sensitive fish populations. Special road management provisions will be used to accomplish this objective. "Low Access Fishing Streams"
Forest Plan standard 3 is not inclusive to this analysis because no streams in the analysis area are listed under "low access fishing streams." However, streams within the analysis area are recognized as to providing beneficial uses.

Fish Standard 4: Provide fish passage to suitable habitat areas, by designing road crossings of streams to allow fish passage or removing in-stream migration barriers.
Within the project area, no human-caused fish migration barriers have been identified; therefore, this objective does not apply to the Mission Brush Project.

Fish Standard 5: Utilize data from stream, river, and lake inventories to prepare fishery prescriptions that coordinate fishery resource needs with other resource activities. Pursue fish habitat improvement projects to improve habitat carrying capacities on selected streams.
As stated in Chapter 3, information was utilized from stream inventories, field reviews, historical records, aerial photographs, analysis of watershed conditions, published scientific literature, discussions with Fisheries Biologists and electrofishing/stocking data from the Idaho Department of Fish and Game (IDF&G), the United States Fish and Wildlife Service (USFWS), electrofishing data from the Idaho Division of Environmental Quality (DEQ) and comprehensive knowledge of the fisheries resources in the Mission Brush project area.

Fish Standard 6: Coordinate management activities with water resource concerns as described in MA 16, Forest Plan Appendices I, and O.
Water resource concerns are protected in Management Area 16 through INFS standards and guidelines.

State of Idaho Governor's Bull Trout Plan: The following describes a "step down" process from the Governors Bull Trout Plan (State of Idaho 1996):

- The mission of the plan is to "…maintain and or restore complex interacting groups of bull trout populations throughout their native range in Idaho.
- The Plan created the Basin Advisory Groups, which oversee the Watershed Advisory Groups (WAG). The Technical Advisory Team's role is to assist the WAG with issues regarding recovery of bull trout in each key watershed.

Streams present in the Mission Brush project area are not known to have bull trout populations. On the Bonners Ferry Ranger District, the mainstem Kootenai River was proposed as critical habitat as a migratory corridor. All stream reaches regulated under INFS were excluded from the critical habitat designation. All streams in the Mission Brush area are regulated by INFS.

B.4 Threatened, Endangered and Sensitive Plant Species

Regulatory Framework

Federal legislation, regulations, policy and direction require protection of species and population viability, evaluation and planning process consideration of Threatened, Endangered and other rare (Forest Service Sensitive) plant species. The regulatory framework for TES plants includes direction from the Regional Watershed, Wildlife, Fisheries and Rare Plants (WWFRP) program and Washington Office as well as the following items:

- Endangered Species Act (1973) as amended;
- National Forest Management Act (1976);
- National Environmental Policy Act (1969);
- Forest Service Manual (2672.1-2672.43);
- Idaho Panhandle National Forests (IPNF) Forest Plan (1987).

Issues and Issue Indicators - TES Plants and Forest Species Of Concern

Issue: Effects of project activities on sensitive and rare plants

Issue Indicator: Relative amount of canopy opening, ground disturbance, or both, in and adjacent to documented rare plant populations or suitable habitat.

Summary of Threatened, Endangered and Sensitive Plants

There are no Threatened or Endangered plant species suspected to occur in the project area. Sensitive plant surveys were conducted in 1997 and 2002. Occurrences of Mingan moonwort (*Botrychium minganense*), triangle moonwort (*B. lanceolatum*) were found near some proposed harvest units. The occurrences would be protected by project design (see Chapter 2 – Required Design Criteria for All Action Alternatives).

It was determined that implementation of any action alternative may directly impact undetected individuals of sensitive moonwort species, but that such impacts would not result in a trend toward federal listing or a loss of population or species viability. There would be no impact to other moist forest sensitive species not found in the project area. No suitable aquatic, peatland, deciduous riparian or dry forest habitat would be impacted under any action alternative.

Alternatives 2 and 3 would directly impact 39 acres of moderately suitable moist forest habitat, 5 acres of suitable cold forest/subalpine forest habitat and no suitable wet forest habitat. No moderately suitable moist forest, cold forest/subalpine or wet forest habitat would be impacted under Alternative 4.

Impacts to suitable sensitive plant habitat under any action alternative would not be expected to lead to a long-term loss of habitat capability. Cumulative impacts to sensitive moonworts and suitable moist forest habitat for moonworts would be low to moderate under all action alternatives. See the project file for a list of sensitive plant species, field survey results and a detailed report.

a. Affected Environment

Methodology

Analysis of the current condition of rare plants and suitable habitat was accomplished using Idaho Conservation Data Center (ICDC) Element Occurrence Records, results of floristic and rare plant surveys, National Wetlands Inventory maps, timber stand examination records, aerial photographs, topographical maps, and professional judgment of the North Zone Botanist. Queries of the Timber Stand Management Record System (TSMRS) were used to provide a "coarse filter" assessment of suitable rare plant habitat in the watershed.

Field surveys of suitable habitat identified by TSMRS often reveal the extent of suitable habitat to be far less than that predicted by the queries. Conversely, specialized habitats and microsites of suitable habitat are usually underrepresented in coarse filter queries. Pre-field review was conducted in 1997.

Threatened and Endangered Plants

There are no federally listed Threatened or Endangered plant species suspected to occur in the project area.

A Threatened species, as determined by the US Fish and Wildlife Service, is any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Currently, the US Fish and Wildlife Service (USDI 2002) indicates three species listed as Threatened for the Idaho Panhandle National Forests (IPNF).

Water howellia (*Howellia aquatilis*) - No occurrences of water howellia are documented in the Kootenai River sub basin. Potentially suitable habitat occurs in the southern portion of the project area, in small ponds north of Brush Lake. Riparian Habitat Conservation Areas established for all wetlands in the project area would protect any suitable habitat for the species.

Ute ladies'-tresses - No suitable habitat was identified in or near the project area. Streams in the project area support vegetation of the coniferous forest zone. All known populations of Ute ladies'-tresses generally occur below the coniferous forest vegetation zone, only occasionally occurring at or near low timberline in the transition between coniferous forest and nonforest or woodland vegetation (Moseley 1999). While the absolute elevation of known populations varies from 1,800 to 7,000 feet, the species occurs at low elevations relative to the surrounding landscape (Moseley 1999).

Spalding's catchfly - A Forest-wide habitat analysis for was conducted using Satellite Imagery Landtype Classification (SILC). This serves as an approximation of habitat occurrence and distribution and can be used as a coarse filter for habitat suitability. Further review such as aerial photograph interpretation and field verification, is necessary to determine the true extent of suitable habitat for Spalding's catchfly. The area was determined to have low potential to support Spalding's catchfly.

Sensitive Plant Species and Forest Species of Concern

Sensitive species are determined by the Regional Forester as those species for which population viability is a concern, as indicated by a current or predicted downward trend in population numbers or habitat capability which would reduce the species' existing distribution. The Northern Regional Forester's sensitive species list for the IPNF contains 63 plant species. Certain species are known to occur only within certain subbasins, while others are known throughout the IPNF. Fifty-six species are known or suspected to occur in the Kaniksu portion of the IPNF, which encompasses the Mission Brush project area.

In addition, several "Forest species of concern" are addressed in this analysis. A Forest species of concern is generally not at risk on a rangewide, region-wide or state level, but may be imperiled within a planning area, such as a National Forest. These species are addressed in effects analysis to provide for maintenance of populations. A discussion of Forest species of concern is included with the discussion of sensitive species. A list of sensitive species and Forest species of concern is included in the Project File.

Slender moonwort (*Botrychium lineare*). - On June 6, 2001, USFWS issued a petition finding that slender moonwort was warranted for listing as Threatened or Endangered but precluded by other higher priority actions (USDI 2001). The species has been added to the USFWS candidate species list. One historical occurrence of slender moonwort is documented from Upper Priest River but has not been seen since 1925. However, because of concerns for the species' viability range-wide, it is addressed in this document as a Forest species of concern.

Rare Plant Guilds

Sensitive plant species and Forest species of concern may be assigned to one or more rare plant guilds. These guilds are artificial assemblages based on similar habitat requirements of two or more rare plant species, and are used for analysis. Rare plant guilds in which most IPNF sensitive plant species occur include the following: aquatic, deciduous riparian, peatland, wet forest, moist forest, dry forest, cold forest and subalpine. Within these guilds, microsites such as small rock seeps and springs can support certain sensitive plants; these microsites are not identifiable at a coarse scale. Larger rock cliffs are often visible on aerial photographs, or can be inferred from topographical maps. A list of habitat guild descriptions is included in the project file with the sensitive species list.

The predicted extent of highly suitable rare plant habitat proposed for activities in shown in the table below. The determination was based on vegetation information in the National Wetland Inventory data and District databases (TSMRS) and is subject to field verification. The project file contains stand-by-stand habitat guild data from which the table below was derived.

Pre-field review results

The Forest species of concern **slender moonwort** (*Botrychium lineare*) has never been documented in numerous surveys on the Bonners Ferry Ranger District. Only one historical occurrence of this rare, primitive fern is documented in the IPNF. Threats to slender moonwort include habitat succession as a result of fire suppression, livestock grazing, exotic species,

development, timber harvest, roads and recreation (Rey-Vizgirdas 2000). No harvest activities are proposed in highly suitable habitat for this species.

Table B-3. Suitable habitat for TES plants and Forest Species of Concern by habitat guild.

Habitat Guild	Total Acres Project Area	Alt 2 acres	Alt 3 acres	Alt 4 acres
Aquatic	94	0	0	0
Peatland	0	0	0	0
Deciduous Riparian	0	0	0	0
Wet Forest	30	0	0	0
Dry Forest	1,529	587	488	587
Moist Forest	1,960	148	148	63
Cold Forest	450	51	51	0
Subalpine	452	132	132	0
No Guild	8,441	1,747	1,327	1,151
Limited data*	1,456	797	797	672
CYPFAS**	2,224	765	401	765

* Stands that lacked sufficient information to assign a habitat guild. All such stands associated with the action alternatives were surveyed.

** CYPFAS = *Cypripedium fasciculatum*, a USFS Region 1 sensitive species currently not known to occur north of the Coeur d'Alene River Ranger District. This species was not found in the project area during rare plant surveys. However, habitats similar to those that support the species in its known range occur in the project area. This species is not currently listed for the Kaniksu portion of the IPNF and will not be discussed further.

Field Survey Results

Rare plant surveys were performed in the 1990s in many proposed harvest units for previous timber sales, including Mission Possible, 96 Tiers, Along Hall, Helitier, Uproaring Salvage, Can Haul, Along Haul Salvage, and Rock Bottom. Rare plant surveys were performed for the Mission Brush project in August of 1997. Following review of the Regional Forester's 1999 sensitive species list, it was determined that surveys for rare mosses and lichens should be conducted. Those surveys were accomplished in October of 2002.

Intensive surveys targeted highly suitable habitat within or adjacent to proposed harvest units. Cursory surveys were conducted in other proposed units to assess the potential for sensitive plant occurrence and to identify small microsites that could support sensitive plant species. Complete results of field surveys are included in the project file.

The actual extent of **subalpine** and **cold forest** habitat in proposed harvest units was found during field surveys to be fewer than five acres combined. Moderately suitable **moist forest** habitat occurs in only one proposed harvest unit under Alternatives 2 and 3 (approximately 39 acres as determined during field surveys). The remainder of moist forest habitat surveyed was found to have low to marginal potential to support rare plants.

No suitable **wet forest habitat** habitat is proposed for harvest under any action alternative.

One **dry forest** species, **least bladdery milkvetch** (*Astragalus microcystis*), occurs about 45 miles south of the project area above Lake Pend Oreille. This species is generally restricted to rock outcrops and gravel banks above large streams and rivers (ICDC 2002). Dry forest habitat identified by project-specific queries was found to lack suitable microsites to support least bladdery milkvetch.

Populations of **Mingan moonwort** (*Botrychium minganense*), **triangle moonwort** (*B. lanceolatum*) and **black snakeroot** (*Sanicula marilandica*) occur in the project area. Two occurrences of Mingan moonwort and one occurrence each of triangle moonwort and black snakeroot were identified adjacent to some proposed harvest units, near proposed unit boundaries.

b. Environmental Consequences

Methodology

Analysis was conducted using results of rare plant surveys, current distribution and condition of rare plant species in habitats similar to those found in the proposed treatment sites, current knowledge of the ecology of rare species known or suspected within the project area, and professional judgment.

The issue indicator for analysis of effects to moist forest moonworts is the relative amount of canopy opening and/or ground disturbance in and adjacent to documented moonwort occurrences and/or suitable habitat. The issue indicator was determined based on the affinity of moist forest moonworts for relatively closed-canopy conditions (ICDC 2002) and their dependence on soil mycorrhizae[1], which may be destroyed during ground-disturbing activities.

The issue indicator for analysis of effects to black snakeroot is the amount of ground disturbance in documented occurrences of the species. Personal observations of this species in north Idaho indicate that populations respond to canopy opening by increased flowering, and that ground disturbance provides for expansion of populations, so long as the populations themselves remain viable.

The cumulative effects area for TES plants is the project area. This area represents the likely limit of effects to rare plant populations from implementation of the action alternatives. Those limits are largely based on the expected distance of spore or seed dispersal and potential for colonization of rare plant populations in areas of suitable habitat. While patterns of dispersal are not known with certainty for many plant species, in studies of *Botrychium virginianum* most spores fell within three meters of the source plant (Peck et al. 1990). Other sensitive species' seeds that are heavier than *Botrychium* spores might be assumed to have similar if not more restricted dispersal patterns.

Cumulative effects to rare plant species and suitable habitat from proposed activities are generally described with the following definitions:

very low	no measurable effect on individuals, populations or habitat
low	individuals, populations and/or habitat not likely affected
moderate	individuals and/or habitat may be affected, but populations would not be affected, and habitat capability would not over the long term be reduced below a level which could support sensitive plant species
high	populations would likely be affected and/or habitat capability may over the long term be reduced below a level which could support sensitive plant species

The past, current, ongoing and reasonably foreseeable events which apply to the cumulative effects analysis for TES plants are discussed as part of the next section.

c. Effects Common to All Action Alternatives

All rare plant occurrences would be buffered from harvest activities under all action alternatives. A qualified botanist would assist with unit layout to ensure adequate buffering of documented rare plant occurrences.

Threatened Species

- **Water howellia** (*Howellia aquatilis*): No occurrences of this species are documented in the Kootenai River sub basin. Riparian Habitat Conservation Areas established for all wetlands in the project area would protect any suitable habitat for the species. **No direct, indirect or cumulative effects** would be expected to occur.
- **Ute ladies'-tresses** (*Spiranthes diluvialis*): Habitat suitability for this species within the project area is considered low. **No direct, indirect or cumulative effects** to Ute ladies'-tresses or any suitable habitat would occur. The USFWS TES plant list #1-9-04-SP-219 signed 4/14/04 has removed Ute ladies'-tresses (*Spiranthes diluvialis*) from the list of threatened species.
- **Spalding's catchfly** (*Silene spaldingii*): Potential for occurrence of this species in the project area was determined to be low. Implementation of either action alternative would have **no direct, indirect or cumulative effects** on the species.

[1] Mycorrhizae are symbiotic relationships between fungi and the roots of certain plant species. Although their ecology is poorly understood, it is apparent that mycorrhizal relationships enhance uptake of nutrients by the host plant (Allen 1991).

Sensitive Species and Forest Species of Concern

Rationale for findings and conclusion is contained within this discussion; a detailed sensitive plants report is located in the Project File. Note that the determination for effects to Moist Forest, Cold Forest and Subalpine species, other than *Botrychium* species, refers to impact on suitable habitat for species of those guilds. As disclosed, no other sensitive species were found in the project area.

Table B-4. Sensitive Plant Species Summary of Conclusion of Effects

Species by Habitat	No Impact	May Impact Individuals Or Habitat, But Will Not Likely Contribute To A Trend Toward Federal Listing Or Loss Of Viability To The Population Or Species	Will Impact Individuals Or Habitat With A Consequence That The Action May Contribute To A Trend Toward Federal Listing Or Cause A Loss Of Viability To The Population Or Species*	Beneficial Impact
Aquatic	X			
Deciduous Riparian	X			
Moist Forest		X		
Wet Forest	X			
Dry Forest	X			
Peatland	X			
Subalpine		X		
Cold Forest		X		

*Considered a trigger for a significant action in NEPA. None of the proposed actions are considered significant.

Proposed Activities

No currently documented populations of any sensitive plant species or Forest species of concern would be directly or indirectly impacted by implementation of any action alternative. Vegetation treatment unit boundaries would be adjusted to exclude any documented occurrences from harvest activities (see Chapter 2, Required Design Criteria for All Action Alternatives).

There is no **deciduous riparian forest** in the project area. No harvest or project-related activities are proposed in **aquatic habitat** in the project area. Based on the location of proposed activities, INFS riparian buffers, and professional judgment, no aquatic habitat able to support any sensitive plant species would be impacted by implementation of any of the action alternatives; there would be no direct or indirect impacts to any sensitive species or habitats in these guilds.

The documented **moonwort** occurrences and their habitat in the project area would be buffered from all harvest activities (see Chapter 2 - Required Design Criteria for All Action Alternatives); no direct impacts would be expected to these occurrences. The buffers would also preserve critical soil mycorrhizae. However, sensitive moonworts occupy a broader habitat range than most other sensitive species; several moonwort species have been found in disturbed meadows and on roadsides. They are often difficult to see because of their small stature, and aboveground stalks do not appear every year.

Individuals that go undetected during floristic surveys may be impacted by harvest activities. Undetected individuals of these species in marginal habitat could be impacted under all action alternatives. Based on past monitoring (Penny 1995), moonwort populations are generally represented by at least some aboveground plants every year. Because negative survey results reduce the risk of populations going undetected, and because moonworts appear adapted to a broad range of habitats, loss of undetected individuals is considered incidental, such impacts would not lead to a trend to federal listing or a loss of population or species viability.

Site-specific surveys would be conducted as needed before implementation of any road decommissioning and appropriate mitigation prescribed as described in Chapter 2. Removal of culverts at stream crossings may directly impact a small amount of suitable rare plant habitat, and undetected individuals of sensitive moonworts may be directly impacted, with no trend to federal listing or loss of population or species viability expected to occur.

Based on current knowledge of the species' distribution, impacts to the Forest species of concern **slender moonwort** (*Botrychium lineare*) would not be expected to occur from implementation of either action alternative. Although occurrences of sensitive moonworts have been identified in numerous surveys on Sandpoint Ranger District, slender moonwort has never been documented.

There would be no impact to **black snakeroot** (*Sanicula marilandica*) from implementation of any of the action alternatives. The documented occurrence of this species would be protected by project design (see Chapter 2 – Required Design Criteria for All Action Alternatives).

There would be no impact to any other **moist forest species** not found in the project area. No impacts to suitable **wet forest guild** habitat would occur, since no such habitat is proposed for any activities.

Rock cliff microsites in the **dry forest guild**, which are potential habitat for least bladdery milkvetch (*Astragalus microcystis*), would not be impacted by harvest activities. No direct, indirect or cumulative impacts to species or habitat of this guild would occur.

Past Activities and Events

Large-scale wildfires and road construction on National Forest and private lands in the project area have likely affected rare plants and/or rare plant habitat through ground disturbance, canopy removal and/or the introduction of exotic plant species.

Timber harvest on National Forest lands may have impacted sensitive plant populations. However, timber harvest activities occurring since 1991 have provided for identification and protection of sensitive plant populations.

Timber harvest on private lands very likely had adverse impacts to sensitive plants and/or suitable sensitive plant habitat; however, there are no requirements to provide for sensitive plant population or species viability on privately owned lands.

US Highway 95 Realignment – sensitive plant surveys were conducted for that project, with no sensitive plants found on National Forest lands in the Right-of-Way.

Current and Ongoing Activities

Road and helispot maintenance would occur in areas with low suitability as rare plant habitat. No effects to rare plants would be expected to occur from these activities.

Reasonably Foreseeable Activities

Weed treatment and monitoring **-** would follow guidelines established in the Bonners Ferry Noxious Weeds Control Project EIS (USDA 1995). No effects to rare plants beyond those described in that EIS are expected to occur.

Pre-commercial thinning **-** would occur in areas with low potential to support rare plants. Other than possible incidental effects to undetected individual moonworts, no impacts to rare plants would be expected to occur.

Tree planting – would occur in areas with low potential to support rare plants. Other than possible incidental effects to undetected individual moonworts, no impacts to rare plants would be expected to occur.

Boat dock replacement at Brush Lake – no sensitive plants or Forest species of concern are documented in Brush Lake. No impacts would be expected to occur.

Bonners Ferry Salvage Sales EA - several stands in the project area are proposed for potential future salvage harvest. Any stands with documented sensitive plant occurrences were dropped from consideration for potential future salvage harvest under the Bonners Ferry Salvage Sales EA. Sensitive plant surveys must be conducted in any stands that have the potential to support rare plant species prior to implementation of harvest activities under the EA.

Timber Harvest and Related Activities on Private Lands – Planned activities on private lands in the project area include grapple piling, burning and planting on lands owned by Forest Capital. The activities would occur in recently harvested areas that likely impacted sensitive plants and/or suitable sensitive plant habitat. Implementation of these activities may also impact sensitive plants.

Rock Pine / Harebrush Timber Sales (and other sales from Rock Bottom EA) – sensitive plant surveys were conducted for that project, with documented occurrences of sensitive moonworts buffered from all harvest activities.

Underburning in Dry Site Old Growth Stands – this activity would occur in habitat with low potential to support any sensitive plant species or Forest species of concern. No impacts would be expected to occur.

d. Potential Effects

Alternative 1 - No Action - Management activities would not change from current levels, and current trends, including increased fuel loading and cycles of tree mortality from root disease and insects would be expected to continue. No impacts to TES plants would occur.

Effects Common to Alternatives 2 and 3 - Under these action alternatives, regeneration harvest in approximately 39 acres of moderately suitable moist forest habitat in Unit 135 may impact undetected individuals of rare **moonwort** populations and temporarily reduce habitat capability. Habitat capability would be expected to recover over the long term. This determination is based on the persistence of some moist forest moonworts in habitats that have experienced regeneration harvest, site preparation and burning (ICDC 2002), and on the evidence of past ground and crown fires in moist forest moonwort populations (USDA 1998a). Unit 135 burned in the 1740s and again in the 1920s.

Impacts to **subalpine** and **cold forest guild** habitat would be negligible, since only about 5 acres of this habitat guild actually occur in proposed harvest units under these alternatives.

Alternative 2 - Temporary road construction under this alternative would occur mostly in areas with low potential for sensitive plants. No documented occurrences of sensitive plants or Forest species of concern would be impacted. Incidental impacts to sensitive moonwort individuals may occur, but would not be expected to reduce population or species viability or lead to a trend to Federal listing.

There impacts would be the same as those described above under Effects Common to All Action Alternatives and Effects Common to Alternatives 2 and 3.

Alternative 3 - With the elimination of road construction, some units proposed under Alternative 2 would not be treated under this alternative; however, none of the units contain suitable rare plant habitat, so there would be no difference in effects with regard to sensitive plants.

There impacts would be the same as those described above under Effects Common to All Action Alternatives and Effects Common to Alternatives 2 and 3.

Alternative 4 - Under this alternative, several of the units proposed under Alternatives 2 and 3 would not be treated. As a result, fewer acres of marginally suitable habitat and no moderately suitable habitat for sensitive moonworts would be treated. In addition, no suitable cold forest or subalpine forest habitat would be impacted under this alternative.

Summary of Cumulative Effects

Based on the above analysis, cumulative impacts to **sensitive moist forest moonworts** under any action alternative would be low (individuals, populations and/or habitat not likely affected) to moderate (individuals and/or habitat may be affected, but populations would not be affected. Over the long-term, habitat capability would not be reduced below a level that could support the species. Cumulative impacts to **black snakeroot** would not be expected to occur under any action alternative. Cumulative impacts to other sensitive **moist forest** species not found in the project area would be very low.

Analysis of the effects of Alternatives 2, 3, and 4 on rare plants was based on TSMRS queries to identify suitable rare plant habitat, results of field surveys, peer-reviewed literature and professional judgment. Past actions were considered in the determination of cumulative effects and are discussed in the botanist's report in the project file.

e. Consistency with the Forest Plan and National Forest Management Act (NFMA)

A Forest Plan management goal is to "manage habitat to maintain populations of identified sensitive species of animals and plants" (USDA 1987, 2-1). A Forest Plan standard for sensitive species is to "manage the habitat of species listed in the Regional Sensitive Species List to prevent further declines in populations which could lead to Federal listing under the Endangered Species Act" (USDA 1987, 2-28). The Forest Plan also identifies the need to "determine the status and distribution of Threatened, Endangered and Rare (sensitive) plants on the IPNF" (USDA 1987, 2-18).

All alternatives would meet Forest Plan direction, as well as NFMA requirements for maintaining population and species viability.

Habitat Guild Descriptions

Detailed descriptions of the following guilds and species known to occur within the guilds are included in the project file:

Subalpine Guild
Cold Forest Guild
Wet Forest Guild
Moist Forest Guild
Dry Forest Guild
Deciduous Riparian
Aquatic Guild
Peatland Guild: This guild can be divided into five distinct sub-guilds, each containing different plant communities and species, substrates, pH and abiotic processes: *poor fen, intermediate/rich fen, ombrotrophic bog, paludified forest, shrub carr*

B.5 Noxious Weeds

The impacts of noxious weed invasions on forest resources and the effectiveness and impacts of different weed treatment methods are discussed in the Bonners Ferry Noxious Weed Control Projects Environmental Impact Statement (USDA 1995), hereby incorporated by reference.

Information on current weed infestations and weed treatment in the project area is derived from a status report submitted by the district weed technician (Bergstrand 2003). A copy of the report is in the project file. Copies of treatment records for Forest roads in the project area are also included in the project file.

Issues and Issue Indicator - Noxious Weeds

Issue: Risk of project activities on the spread of existing weed infestations and introduction of new weed invaders.
Issue Indicator: Relative amount of canopy removal and ground or understory vegetation disturbance.

Affected Environment

Current Weed Infestations

Noxious and undesirable weeds are currently infesting several sites in the project area. The following weeds have been observed primarily along roads (both open and closed) in the project area:

Absinthe wormwood (*Artemesia absinthe*)
spotted knapweed (*Centaurea maculosa*)
Canada thistle (*Cirsium arvense*)
sulfur cinquefoil (*Potentilla recta*)
bull thistle (*Cirsium vulgare*)
meadow hawkweed (*Hieraceum pratense*)
goatweed (*Hypericum perforatum*)
common tansy (*Tanacetum vulgare*)
oxeye daisy (*Leucanthemum vulgare*)

The heaviest infestations occur on roads in intermingled ownership (FS road 2217 and lower portion of FS 272) and on closed spur roads in the lower portion of Mission Creek. In some areas, meadow hawkweed, thistles, and spotted knapweed have spread off the road prism.

While weed infestations in the lower portion of Mission Creek are heavy, the upper portion on the drainage and the Hall Mountain area are considered relatively weed free. Weed infestations are also much lower in the Brush Lake area (FS road 1004, FS road 2485 and FS road 397); following several years of monitoring and treatment, weed populations on FS 1004 in particular have been reduced to “almost negligible levels” (see project file).

The project file contains a map showing heavily infested, and relatively weed free areas within the project area. Under all action alternatives, cleaning of all off-road equipment would be required before moving from heavily infested to relatively weed-free areas.

Past, Current and Planned Treatments

Because of the high level of weed infestations on FS roads 2217 and 272 and their spurs, and because of a lack of coordination in weed treatment with private and private industry owners, these roads are a lower priority for treatment. Treatments in the

last several years have focused on preventing weed spread along the open roads in the lower portion of Mission Creek. Future weed treatment in this area will be conducted with the same focus.

Weed treatments in the upper portion of Mission Creek and in the Hall Mountain and Brush Lake areas have been more successful at substantially reducing weed infestations from prior levels. Treatment needs have decreased over the years on roads in this portion of the project area (see project file). Priorities for continued monitoring and spot treatment in this area will continue to focus on campground roads and open roads to high use sites, with other roads treated as funding allows.

a. Effects Analysis

Methodology

Analysis was conducted using results of past noxious weed surveys, current distribution of weed species in habitats similar to those found in the proposed treatment sites, and types of proposed treatments. The estimation of risk of weed spread and introduction of new weed invaders from the proposed activity is based on peer-reviewed literature, experience in the project area and on similar sites in the IPNF, and professional judgment.

Effects of proposed actions on noxious weed spread are based on the difference between alternatives in the amount of canopy removal, and predicted amount of soil and/or understory vegetation disturbance.

Analysis of effects to noxious weeds from various activities relies on the following assumptions:

- Where harvest would be ground-based, there would be more ground disturbance than with helicopter logging. Therefore, the risk of weed spread would be higher than where helicopter logging would occur.
- Selective timber harvest would remove approximately 30 percent of the tree canopy, allowing for increased understory vegetation growth, including some noxious weed species. The effects of commercial thinning would be similar to those of selective harvest.
- Regeneration treatments remove a significant portion of the canopy (greater than 70 percent), and would treat fuels with site preparation. This type of harvest and fuels treatment carries a greater risk of weed spread than selective harvest or commercial thinning, particularly when in proximity to existing infestations.
- Even in the absence of soil or vegetation disturbance, some weed species may invade if tree canopy cover is significantly reduced.

b. Direct and Indirect Effects

Alternative 1 – No Action

Under the No Action alternative, there would be no change in the risk or rate of weed spread, since management practices would not change from current conditions. Treatment of existing weed infestations and monitoring for new invaders would be dependent on District priorities and the availability of appropriated funding.

Since no road decommissioning would occur, it is doubtful that existing weed infestations on old, undriveable roads would be treated. Untreated weeds would provide a continued seed source for further expansion in the project area.

All other effects from the No Action Alternative are discussed below under Effects Common to All Alternatives.

Alternative 2

There would be a risk of weed spread associated with temporary road construction, timber harvest activities and a proposed wildlife burn. The proposed wildlife burn would occur in the portion of the project area that is considered to be relatively weed-free.

The risk of weed spread in susceptible habitat proposed for underburning would vary for different plant communities. Those dry areas where shrub species are predicted to dominate would be at lower risk, while dry grass and forb-dominated communities would be at higher risk for weed invasion. With monitoring and treatment as proposed in Chapter 2, the risk of new invaders spreading to the area of the wildlife burn would be low. The risk of existing infestations expanding into the burned area would be reduced but not eliminated.

Based on past monitoring (see project file), preventive seeding and monitoring would greatly reduce the risk of new invaders becoming established in the project area. Following decommissioning of temporary roads and preventive seeding, the risk of

weed spread would decrease over time as desired species become established. For desired vegetation to become established, the decommissioned roads would be monitored and treated as needed (see Chapter 2 – Noxious Weed Measures).

All other effects from the Modified Proposed Action are discussed below under Effects Common to All Alternatives and Effects common to All Action Alternatives.

Alternative 3

Because there would be no new road construction under this alternative, there would be slightly less risk of weed spread than under Alternative 2. There would also be less timber harvest and fuels treatment and no wildlife burn under this alternative, resulting in less soil and understory vegetation disturbance, and less risk of weed spread.

All other effects from the No New Roads Alternative are discussed below under Effects Common to All Alternatives and Effects common to All Action Alternatives.

Alternative 4

Because fewer acres would be treated under this alternative, there would be less ground or canopy disturbance from timber harvest and fuels treatment and a lower risk of weed spread than under Alternative 2 or 3.

However, as under Alternative 2, there would be a risk of weed spread from road construction and a proposed wildlife burn. The proposed wildlife burn would occur in the portion of the project area that is considered to be relatively weed-free.

As under Alternative 2, the risk of weed spread in susceptible habitat proposed for underburning would vary for different plant communities. Those dry areas where shrub species are predicted to dominate would be at lower risk, while dry grass and forb-dominated communities would be at higher risk for weed invasion. With monitoring and treatment as proposed in Chapter 2, the risk of new invaders spreading to the area of the wildlife burn would be low. The risk of existing infestations expanding into the burned area would be reduced but not eliminated.

With monitoring and treatment as proposed in Chapter 2, the risk of new invaders spreading to the area of the wildlife burn would be low. The risk of existing infestations expanding into the burned area would be reduced but not eliminated.

All other effects from the Wildlife Alternative are discussed below under Effects Common to All Alternatives and Effects common to All Action Alternatives.

Direct and Indirect Effects Common to All Action Alternatives

There is a risk of weed spread from ground disturbing harvest activities, particularly along skid trails and in regeneration harvest units. Preventive seeding of native and desired non-native species would reduce, but not eliminate, the risk of weed spread. Treatment of weeds along haul routes would greatly reduce the risk of weed spread.

Contract requirements to clean off-road harvest equipment prior to entry into the sale area would further reduce the risk of weed spread. The risk of introduction and establishment of new weed invaders to the project area is expected to be low with implementation of the above measures (see Chapter 2, Noxious Weed Measures). The requirement for cleaning of off-road equipment before moving from weed-infested to relatively weed-free portions of the project area would further reduce the risk of weed spread.

A slight increase in the risk of weed spread is predicted for grapple piling. Though many of the common weeds invade after site preparation, they tend to decrease as the site becomes stocked with planted conifers and native vegetation. This long-term process of vegetation succession may take 20-30 years or more to achieve canopy closure.

There would be no measurable increase in the risk of weed spread from tree planting. Only a small amount of soil disturbance would occur with clearing of planting spots. As the planted trees grew, the canopy would eventually close to shade out many weed species.

There would be a temporary increase in risk of weed spread following road decommissioning. Pre-treatment of existing infestations and preventive seeding would reduce the risk of further spread over time to current levels. In addition, newly decommissioned roads would be monitored over a three-year period to detect new weed invaders and to assess the success of

preventive measures. Without the recurring disturbance of road maintenance and use, and with increasing canopy coverage of desired species, risk of weed spread would decline to below the level for open or gated roads.

Goatweed and spotted knapweed may increase, at least temporarily, in some areas following harvest and fuels treatment activities. After a fall burn in western Montana in Douglas-fir/ninebark habitat dominated by shrubs, spotted knapweed was not present in the first post-fire year, but its volume doubled two years following the burn compared with pre-burn volume (Noste 1982) . After a spring burn of lesser intensity on an adjacent site, no spotted knapweed was recorded before or after burning. Shrubs recovered faster and grasses increased on the spring burn, while herbaceous cover recovered faster and non-graminoid herbaceous species increased in the fall burn (Noste 1982).

Goatweed may also increase on burned sites. Weed prevention and treatment measures would reduce but not eliminate the potential for spread of goatweed and knapweed into previously uninfested areas.

Direct and Indirect Effects Common to All Alternatives

With implementation of any alternative, seeds from any weeds on Forest roads in the project area may still be transported within and out of the area by vehicles, people, birds, and wildlife. There is still a high potential for weed spread on roads in mixed ownership from untreated infestations on private and private industry lands. In these areas of mixed ownership, the main Forest roads would likely need continual treatment at some level to prevent further spread of weeds along the road prism.

It is likely that treatment of at least some Forest Roads in the project area would continue as needed to protect the investments made in previous years, with priority given to roads in the project area that are considered to be relatively weed-free. Treatment needs are expected to decrease over time as species that are more desirable establish along those roads.

Based on past monitoring (see project file), successful weed treatment would remove the majority of new seed source on National Forest roads, which occurs in greater concentrations on roadsides, and would slow the rate of spread of most weed species within the project area. In addition, maintenance treatment levels are generally less intensive once weed infestations have been substantially reduced (Bergstrand personal communication).

Cumulative Effects

Determination of the cumulative effects area for weeds considered likely seed dispersal distances and the extent of currently documented weed infestations. Transport of weed seeds out of the watershed is possible, with occasional transport over long distances (such as on vehicles). However, it would be difficult to predict the extent of such long-distance dispersal. It is likely that most seeds of noxious weeds would fall close to the parent plant.

In addition, adjacent watersheds have noxious weed infestations similar in composition and distribution to those on National Forest lands, so transport of weed seeds to these lands from the project area would have little additional impact. For these reasons, the cumulative effects analysis area for noxious weeds is the project area.

Cumulative effects related to noxious weeds from proposed activities are generally described as very low, low, moderate or high, with the following definitions:

very low =	no measurable effect on existing weed infestations or susceptible habitat
low =	existing weed infestations and/or susceptible habitat not likely affected
moderate =	existing weed infestations or susceptible habitat affected, with the potential for expansion into uninfested areas and/or establishment of new invaders
high =	weed infestations and/or susceptible habitat affected, with a high likelihood of expansion into uninfested areas and/or establishment of new invaders.

c. Cumulative Effects Common to All Alternatives

Under all alternatives, cumulative effects with regard to new invaders are expected to be low. Under Alternative 1, because there is a high likelihood that weed management efforts would continue to protect investments already made, and because no new disturbance would occur, no new invaders are expected to become established. Under Alternatives 2, 3 and 4, because of features designed to detect and eradicate new invaders, no new invaders are expected to become established.

Cumulative effects with regard to existing weed infestations are expected to be low to moderate considering the following:

Past Activities and Events

Past large-scale wildfires, timber harvest and road construction provided areas of disturbance of soil, vegetation and canopy cover for invasion by non-native plant species, including noxious weeds. Because of inadequate past weed prevention and control practices, the effects of these activities, particularly in areas of mixed ownership, on noxious weed spread are still evident. However, recent monitoring shows that current weed control efforts have greatly reduced infestations on National Forest lands in the project area (see project file).

The loss of canopy cover from past activities and events is considered irretrievable but not irreversible. As tree canopy closes weeds that are shade-intolerant will, over the long term, be displaced by shade-tolerant species. This process could take 20-30 years or more.

US Highway 95 Realignment would pose a risk of weed spread from ground disturbance; however, design features to mitigate that risk, including revegetation with desired species, would reduce that risk.

Current and Ongoing Activities

Helispot maintenance would include noxious weeds monitoring and treatment activities. The risk of weed spread from this activity would be mitigated by weed treatment and preventive seeding practices.

Road maintenance activities may result in ground disturbance that would be conducive to new weed invaders becoming established, and to the spread of existing weed populations. Preventive seeding with desired species and regular monitoring for weeds would reduce but would not eliminate this risk.

Trail maintenance activities generally result in low levels of ground disturbance and present a low risk of weed spread.

Reasonably Foreseeable Actions

Noxious Weed Treatment And Monitoring – These activities would follow guidelines established in the Bonners Ferry Noxious Weeds Control Project EIS (USDA 1995). The risk of new invaders becoming established would be low. Mitigation measures to reduce the risk of weed spread as a result of project activities would protect recent investments in weed management on Forest Roads in the project area. The impacts of noxious weed invasions on existing weed infestations and the effectiveness and impacts of different weed treatment methods are discussed in the Bonners Ferry Noxious Weed Control Project Environmental Impact Statement (USDA 1995), which is incorporated by reference.

Weed treatment activities would be successful in controlling goatweed and spotted knapweed along road prisms, but in the short-term would not have a significant effect on these species where they occur away from Forest roads. These two species are considered naturalized in the project area, and would not be eradicated by weed treatment efforts.

The short-term management goal for goatweed and spotted knapweed is to reduce the risk of seed and plant parts being transported out of the project area. The long-term goal is to reduce the size of infestations and slow the rate of spread within the project area. Based on past monitoring (see project file), treatment of existing infestations on haul routes with approved herbicides, and preventive seeding and monitoring on skid trails, would greatly reduce the risk of transporting these species off-site.

Should funding allow, biological control agents for knapweed and goatweed may be released in off-road infestations and would over time reduce the incidence of those species. Treatment of most other weed species, which are mostly confined to road prisms, would be moderately to highly effective in reducing their spread within the project area.

Meadow hawkweed infestations along open road prisms and on closed roads to be decommissioned or put into storage would be treated. However, off-road infestations – particularly those on private and private industry lands – would continue to provide a seed source. Consequently, there would be a risk of reinfestation of treated roads in areas of intermingled ownership. Meadow hawkweed is not likely to be eradicated from the project area without a cooperative effort among all landowners in the project area (Bergstrand personal communication).

Successful native seeding in disturbed areas, in conjunction with monitoring and weed treatment as proposed, would provide for revegetation of desired species and would reduce the available ecological niche for weeds to occupy. One study has shown that competition from desired species - especially grasses - reduces spotted knapweed survival, biomass and reproduction (Steinger and Muller-Scharer 1992).

Timber stand improvement projects (precommercial thinning and pruning) would not result in sufficient ground disturbance or tree canopy removal to affect weed spread.

Dock replacement at Brush Lake would have a low risk of introducing weeds to the lake, with the requirement to clean off-road equipment proposed in Chapter 2.

Timber harvest and related activities on private lands would pose a moderate to high risk of weed spread within those lands and a moderate to high risk of reinfestation in adjacent National Forest lands, as long as infestations on private lands remain untreated.

Rock Pine / Harebrush Timber Sales (Rock Bottom EA) – would pose a risk of weed spread; however, contract requirements to clean off-road equipment would reduce that risk.

Underburning in dry site old growth stands – there would be a risk of weed spread from this activity. The risk of weed spread would depend on the proximity of weed infestations to the stands that would be burned, the time of year and intensity of the burns, and the understory composition of the stands to be burned. As stated above, stands with a higher brush component are more resistant to weed establishment than stands dominated by an understory of grass and forb species.

Cumulative Effects Common to Alternatives 2, 3 and 4

Cumulative effects with regard to existing weed infestations are expected to be low to moderate considering the following:

Short-term cumulative effects regarding susceptibility to weeds would be associated with ground disturbing activities proposed in the action alternatives. Proposed mitigation (see Chapter 2 – Noxious Weed Measures) would reduce but not eliminate the risk.

Over the long term, the loss of canopy cover from implementing the proposed activities is considered irretrievable but not irreversible. As tree canopy closes, susceptibility of areas proposed for harvest and/or underburning would decrease. However, this process could take 20-30 years or more.

For spotted knapweed, some evidence suggests that as succession proceeds and nutrients become less available, the competitive advantage shifts from spotted knapweed to native plants such as bluebunch wheatgrass (Krueger et al. 2001).

There is a risk of weed spread from harvest activities, particularly along skid trails and in regeneration harvest units. There would be a risk of weed spread associated with road reconstruction. Preventive seeding and monitoring as proposed would reduce, but not eliminate, the risk of weed spread. Following recontour of roads and preventive seeding, the risk of weed spread would decrease over time to its present level.

Preventive seeding of native and desired non-native species on all areas disturbed during harvest activities would reduce, but not eliminate, the risk of spread. Proposed treatment of weeds along haul routes prior to ground-disturbing activities would greatly reduce the risk of weed spread (see Chapter 2, Noxious Weed Measures). Proposed contract requirements to wash off-road harvest equipment prior to entry onto National Forest lands would further reduce the risk of weed spread (see Chapter 2, Noxious Weed Measures).

Additional measures designed to reduce the risk of spread from heavily infested areas to relatively weed-free areas are described in Chapter 2, Noxious Weed Measures.

d. Forest Plan Consistency

According to the Idaho Panhandle Forest Plan (1987) direction, infestations of many noxious weed species, including knapweed, goatweed and common tansy, are so widespread that control would require major programs that are not possible within expected budget levels (Forest Plan, p. II-7). Forest Plan direction is to "provide moderate control actions to prevent new weed species from becoming established". The No Action alternative meets Forest Plan direction by not creating disturbance conducive to new noxious weed invasions or spread of existing weed populations. Alternatives 2, 3 and 4 provide moderate control actions through project design, as required by the Forest Plan, to prevent new weed species from becoming established.

It should be noted that, since the Forest Plan was implemented in 1987, the issue of weed infestations on National Forest lands has evolved to encompass broader issues of native ecosystem integrity and the effects to non-commodity resources and ecosystem processes. Appropriated and Knutsen-Vandenberg funding levels for noxious weeds programs in the IPNF have

increased dramatically since the mid-1990s, and the trend is toward sustaining or increasing those funding levels (see the project file). The Forest Plan revision process will consider the increased emphasis on weed management.

B.6 Botany and Noxious Weeds Literature Citations

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USDA Forest Service. 1987. Idaho Panhandle National Forests Forest Plan. Coeur d'Alene, Idaho.

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APPENDIX C

Site Specific Best Management Practices

Introduction

The Forest Service is required by law to comply with water quality standards developed under authority of the Clean Water Act. The Environmental Protection Agency and the States of Idaho are responsible for enforcement of these standards. The Idaho Panhandle National Forest Plan states (Chapter II, p. 27) that the Forest will "maintain high quality water to protect fisheries habitat, water based recreation, public water supplies and be within state water quality standards". The use of BMPs is also required in the Memorandum of Understanding between the Forest Service and the State of Idaho as part of our responsibility as the Designated Water Quality Management Agency on National Forest System lands. The State's water quality standards regulate nonpoint source pollution from timber management and road construction activities through application of Best Management Practices (BMPs). The BMPs were developed under authority of the Clean Water Act to ensure that Idaho's waters do not contain pollutants in concentrations, which adversely affect water quality or impair a designated use. State recognized BMPs that will be used during project design and implementation are contained in these documents:

1) Rules and Regulations Pertaining to the Idaho Forest Practices Act, (IFPA), as adopted by the Idaho Land Board; and
2) Rules and Regulations and Minimum Standards for Stream Channel Alterations, as adopted by the Idaho Water Resources Board under authority of the Idaho Stream Channel Protection Act (ISCPA).

Many of the rules and regulations for stream channel alterations are contained, in slightly different forms, in two Memorandum of Understandings (MOU) between the USFS and the State of Idaho. These MOUs are incorporated into the Forest Manual and R-1 Supplement 31, contains provisions which are not currently state recognized BMPs.

The practices described herein are tiered to the practices in FSH 2509.22. They were developed as part of the NEPA process, with interdisciplinary involvement, and meet state and Forest water quality objectives. The purpose of this appendix is to: 1) establish the connection between the Soil and Water Conservation Practice (SWCP) employed by the Forest Service and BMP's identified in Idaho Water Quality Standards (IDAPA 16.01.2300.05) and 2) identify how the SWCP Standard Specifications for the Construction of Roads, and the Timber Sale Contract provisions meet or exceed the Rules and Regulations pertaining to the Idaho Forest Practices Act, Title 38, Chapter 13, Idaho Code. The relevant portions of the Rules and Regulations developed under the Idaho Stream Protection Act are also covered.

The objective of this appendix is to provide conservation practices for use on National Forest Lands to minimize the effects of management activities on soil and water resources. The conservation practices were compiled from Forest Service manuals, handbooks, contract and permit provisions, to directly or indirectly improve water quality, reduce losses in soil productivity and erosion, and abate or mitigate management effects, while meeting other resource goals and objectives. They are of three basic forms: administrative, preventive and corrective. These practices are neither detailed prescriptions nor solutions for specific problems. They are purposely broad. These practices are action initiating process mechanisms, which call for the development of requirements and considerations to be addressed prior to and during the formulation of alternatives for land management actions. They serve as checkpoints, which are considered in formulating a plan, a program and/or a project.

Although some environmental impacts may be characteristic of a management activity, the actual effects on soil and water resources will vary considerably. The extent of these management effects on soil and water resources is a function of:

1) The physical, meteorological and hydrologic environment where the activity takes place (topography, physiography, precipitation, channel density, geology, soil type, vegetative cover, etc.).
2) The type of activity imposed on a given environment (recreation, mineral exploration, timber management, etc.) and its extent and magnitude.
3) The method of application and the duration of the activity (grazing system used, types of silvicultural practice used, constant vs. seasonal use, recurrent application or onetime application, etc.).
4) The season of the year that the activity occurs or is applied.

These factors vary within the National Forests in the Northern Region and from site to site. It follows then that the extent and kind of impacts are variable, as are the abatement and mitigation measures. No solution prescription, method, or technique is best for all circumstances. Thus the management practices presented in the following include such phrases as "according to the design", "as prescribed," "suitable for," "within acceptable limits," and similar qualifiers. The actual prescriptions, specifications, and designs are the result of evaluation and development by professional personnel through interdisciplinary involvement in the NEPA process. This results in specific conservation practices that are tailored to meet site specific resource requirements and needs.

BMP Implementation Process

In cooperation with the States, the USDA Forest Service's primary strategy for the control of nonpoint sources is based on the implementation of BMP's determined necessary for the protection of the identified beneficial uses. The Forest Service Nonpoint Source Management System consists of:

1) BMP selection and design based on site-specific conditions; technical, economic and institutional feasibility; and the designated beneficial uses of the streams.
2) BMP Application
3) BMP monitoring to ensure that they are being implemented and are effective in protecting designated beneficial uses.
4) Evaluation of BMP monitoring results.
5) Feeding back the results into current/future activities and BMP design.

The District Ranger is responsible for insuring that this BMP feedback loop is implemented on all projects. The Practices described herein are tiered to the practices in the R1/R4 FSH 2509.22. They were developed as part of the NEPA process, with interdisciplinary involvement, and meet State and Forest water quality objectives. The purpose of this appendix document is to: 1) establish the connection between the SWCP employed by the Forest Service and BMP's identified in Idaho Water Quality Standards (IDAHO APT 16.01.2300.05) and 2) identify how the SWCP, Standard Specifications for the Construction of Roads, and the Timber Sale Contract provisions meet or exceed the Rules and Regulations Pertaining to the Idaho Forest Practices Act, Title 38, Chapter 13, Idaho Code (BMP's). The relevant portions of the Rules and Regulations developed under the Idaho Stream Protection Act are also included.

Format of the BMPs

Each Soil and Water Conservation Practice (SWCP) is described as follows:
Title: Includes the sequential number of the SWCP and a brief title.
Objective: Describes the SWCP objective(s) and the desired results for protecting water quality.
Effectiveness: Provides a qualitative assessment of expected effectiveness that the implemented BMP will have on preventing or reducing impacts on water quality. The SWCP effectiveness rating is based on: 1) literature and research (must be applicable to area 2) administrative studies (local or within similar ecosystem); and 3) professional experience (judgment of an expert by education and/or experience). The expected effectiveness of the SWCP is rated either High, Moderate or Low.

High: Practice is highly effective (>90%) and one or more of the following types of documentation are available:
a) Literature/Research - must be applicable to area
b) Administrative studies - local or within similar ecosystem
c) Experience - judgment of an expert by education and/or experience.
d) Fact - obvious by reasoned (logical response).

Moderate: Documentation shows that the practice is effective less than 90% of the time, but at least 75% of the time.
Or -- Logic indicates that this practice is highly effective, but there is little or no documentation to back it up.
Or -- Implementation and effectiveness of this practice will be monitored and the practice will be modified if necessary to achieve the objective of the BMP.

Low: Effectiveness unknown or unverified, and there is little to no documentation
Or -- Applied logic is uncertain in this case, or the practice is estimated to be less than 75% effective.
Or -- This practice is speculative and needs both effectiveness and validation monitoring.

The effectiveness estimates given here are general, given the range of conditions throughout the Forest. More specific estimates are made at the project level when the BMPs are actually prescribed.

Compliance: Provides a qualitative assessment of how the implementation of the specific measures will meet the Forest Practice Act Roles and Regulations pertaining to water quality.

Implementation: This section identifies: (1) the site-specific water quality protection measures to be implemented and (2) how the practices are expected to be applied and incorporated into the Timber Sale Contract.

Items Common To All Soil And Water Conservation Practices

Responsibility for Implementation: The District Ranger (through the Presale Forester) is responsible for insuring the factors identified in the following SWCPs are incorporated into: Timber Sale Contracts through the inclusion of proper B and/or C provisions; or Public Works Contracts through the inclusion of specific contract clauses.

The Contracting Officer, through his/her official representative (Sale Administrator and/or Engineering Representatives for timber sale contracts; and Contracting Officers Representative for public works contracts) is responsible for insuring that the provisions are properly administered on the ground.

Monitoring: Implementation and effectiveness of water quality mitigation measures are also monitored annually. This includes routine monitoring by timber sale administrators, road construction inspectors, and resource specialists which is documented in diaries and project files. Basically, water quality monitoring is a review of BMP implementation and a visual evaluation BMP effectiveness. Any necessary corrective action is taken immediately. Such action may include modification of the BMP, modification of the project, termination of the project, or modification of the state water quality standards.

Abbreviations

TSC = Timber Sale Contract
TSA = Timber Sale Administrator
PWC = Public Works Contract
SCA = Stream Channel Alteration Act
BMP = Best Management Practices
SPS = Special Project Specifications
CFR = Code of Federal Regulations
SAM = Sale Area Map
COR = Contracting Officer Representative
IFPA = Idaho Forest Practices Act
SWCP= Soil and Water Conservation Practices
SMZ = Streamside Management Zone
EPA = Environmental Protection Zone

Key Soil And Water Conservation Practices

Class * Soil and Water Conservation Practice (FSH 2509.22)

11 WATERSHED MANAGEMENT

W 11.07 Oil and Hazardous Substance Spill Contingency Planning
W 11.09 Management by Closure to Use
W 11.11 Petroleum Storage & Delivery Facilities & Mgt

13 VEGETATION MANIPULATION

G 13.02 Slope Limitations for Tractor Operation
G 13.03 Tractor Operation Excluded from Wetlands, Bogs, and Wet Meadows
E 13.04 Revegetation of Surface Disturbed Areas
E 13.05 Soil Protection During and After Slash Windrowing
E 13.06 Soil Moisture Limitations for Tractor Operation

14 TIMBER

A 14.02 Timber Harvest Unit Design
A 14.03 Use of Sale Area Maps for Designating Soil and Water Protection Needs
A 14.04 Limiting the Operating Period of Timber Sale Activities
E 14.05 Protection of Unstable Areas
A 14.06 Riparian Area Designation
G 14.07 Determining Tractor Loggable Ground

E 14.08 Tractor Skidding Design
E 14.09 Suspended Log Yarding in Timber Harvesting
A 14.10 Log Landing Location and Design
E 14.11 Log Landing Erosion Prevention and Control
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E 14.14 Revegetation of Areas Disturbed by Harvest Activities
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S 14.17 Streamcourse Protection (Implementation and Enforcement
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E 14.20 Slash Treatment in Sensitive Areas
A 14.22 Modification of the Timber Sale Contract

15 ROADS AND TRAILS

A 15.02 General Guidelines for Road Location/Design
E 15.03 Road and Trail Erosion Control Plan
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E 15.07 Control of Permanent Road Drainage
E 15.08 Pioneer Road Construction
E 15.09 Timely Erosion Control Measures on Incomplete Road and Streamcrossing Projects
E 15.10 Control of Road Construction Excavation & Sidecast Material
S 15.11 Servicing and Refueling of Equipment
S 15.12 Control of Construction In Riparian Areas
S 15.13 Controlling In-Channel Excavation
S 15.14 Diversion of Flows Around construction Sites
S 15.15 Stream crossings on Temporary Roads
S 15.16 Bridge & Culvert Installation (Disposition of Surplus Material and Protection of Fisheries)
E. 15.17 Regulation of Borrow Pits, Gravel Sources, and Quarries
E 15.18 Disposal of Right-of-Way and Roadside Debris
S 15.19 Streambank Protection
E 15.21 Maintenance of Roads
E 15.22 Road Surface Treatment to Prevent Loss of Materials
E 15.23 Traffic Control During Wet Periods
G 15.24 Snow Removal Controls
E 15.25 Obliteration of Temporary Roads
E 15.27 Trail Maintenance and Rehabilitation

18 FUELS MANAGEMENT

E 18.02 Formulation of Fire Prescriptions
E 18.03 Protection of Soil and Water from Prescribed Burning Effects

* **CLASSES OF SWCP (BMP)**

A = Administrative G = Ground Disturbance Reduction
E = Erosion Reduction W = Water Quality Protection
S = Stream Channel Protection/Stream Sediment Reduction

Best Management Practices

PRACTICE 14.03 - Use of Sale Area Maps for Designating Soil and Water Protection Needs

OBJECTIVE: To delineate the location of protection areas and special treatment areas, to insure their recognition, proper consideration, and protection on the ground.

EFFECTIVENESS: High

COMPLIANCE: No related FPA rule

IMPLEMENTATION: The following features will be designated on the SAM:

The stream courses (perennial, intermittent, and ephemeral) listed below will be designated as Stream Course Protection areas to be protected under the TSC. During layout of the units these areas will be excluded where possible. Where these areas cannot be easily excluded from the unit, these areas will be excluded by designating the timber as leave trees. INFISH standards and protected stream courses will be applied to the following areas:

a. Wetlands (meadows, lakes, potholes, etc.) to be protected per the timber sale contract clauses are those designated on the Fish and Wildlife Service 1:24000 scale wetland maps.
b. Ephemeral channels will be protected through unit layout, marking plans, and/or designation on sale area maps.

The Purchaser and the Sale Administrator prior to harvesting will review these features on the ground.

A Watershed Specialist (Forest or District) will work with the Presale Forester to insure that the above features have been designated on the Sale Area Map during contract development.

PRACTICE: 14.11 - Log Landing Erosion Prevention and Control
PRACTICE: 14.12 - Erosion Prevention and Control During Timber Sale Operations
PRACTICE: 14.15 - Erosion Control on Skid Trails.

OBJECTIVE: To protect water quality by minimizing erosion and subsequent sedimentation derived from log landings and skid trails.

EFFECTIVENESS: Moderate

COMPLIANCE: Meets FPA rules

IMPLEMENTATION: The following minimum criteria will be used in controlling erosion and restoring landings and skid trails so as to minimize erosion:

General:
1) Deposit waste material from construction or maintenance of landings and skid and fire trails in geologically stable outside of Riparian Habitat Conservation Areas.
2) Seeding will be done with a seed/fertilizer mix specified in the contract.

Landings:
1) Landings will <u>not</u> be located in ephemeral draws or swales that were created by or are prone to landslides.
2) During period of use, landing will be maintained in such a manner that debris and sediment are not delivered to any streams.
3) Landings shall be reshaped as needed to facilitate drainage prior to fall and spring runoff. Landings shall be stabilized by establishing ground cover or by some other means within one year after harvesting is completed.
4) Landings will drain in a direction and manner that will minimize erosion and will preclude sediment delivery to any stream.

Skid Trails:

1) Unit design and location will facilitate logging with a minimum amount of excavated skid trails. Where excavated trails are constructed they will be kept to a minimum and must be obliterated by the purchaser following completion of the logging activities. The obliteration will include restoring natural slope contours and placing slash and logs on top of the disturbed soil, and use of seeding where needed.
2) Skid trails and fire trails shall be stabilized whenever they are subject to erosion, by waterbarring, cross draining, outsloping, scarifying, seeding, or other suitable means. This work shall be kept current to prevent erosion prior to fall and spring runoff.
3) Spacing of water bars on skid trails will be based on guides for controlling sediment from secondary logging roads (no date). If necessary, additional water bars will be prescribed by the sale administrator and/or watershed specialist.
4) All skid trail and landing locations will be approved by the Forest Service prior to harvesting and will be rehabilitated as necessary to assure that normal drainage patterns are maintained, and that exposed soil surfaces are seeded or covered with slash. This will minimize the potential for sediment production and delivery.
5) Skid trail distance will average 100 feet or greater on ground skidded units, except where the trails converge to landings and as terrain dictates otherwise. This measure will help assure that no more than 15 percent of the activity area will be detrimentally disturbed per Region-1 soil standards.
6) Mechanical fellers will only be allowed off skidtrails if they travel on snow, frozen ground, or a slash mat (to avoid soil compaction levels that exceed Region 1 standards).

Corridors:

1) Corridors that have become entrenched below the litter layer into the topsoil and could channel water will be water-barred and/or covered with debris.

PRACTICE 14.19 - Acceptance of Timber Sale Erosion Control Measures Before Sale Closure

OBJECTIVE: To assure the adequacy of required erosion control work on timber sales.

EFFECTIVENESS: High

COMPLIANCE: No directly related FPA rule.

IMPLEMENTATION: The TSC requires that upon the Purchaser's written request and assurance that work has been completed the Forest Service shall perform an inspection. In evaluating acceptance the following definition will be used by the Forest Service: "Acceptable" erosion control means only minor deviation from established standards, provided no major or lasting impact is caused to soil and water resources. The Forest Service will not accept as complete, erosion control measures that fail to meet this criteria.

PRACTICE 15.07 - Control of Permanent Road Drainage

OBJECTIVE: To minimize the erosive effects of concentrated water and the degradation of water quality by proper design and construction of road drainage systems and drainage control structures.

EFFECTIVENESS: Moderate

COMPLIANCE: Meets FPA rules

IMPLEMENTATION: The following items will be included in the identified road contract specifications or drawings.

1) For Reconstruction - The following criteria will be incorporated into the road design:
   a. The reconstruction will include increasing pipe sizes or changing design on many of the existing

PRACTICE 15.14 - *Diversion of Flows Around Construction Sites*

OBJECTIVE: To minimize downstream sedimentation by insuring that all stream diversions are carefully planned.

EFFECTIVENESS: High

COMPLIANCE: Meets SCA Rules

IMPLEMENTATION: Flow in stream courses may only be diverted if the Forest Service deems it necessary for the contractor to meet contractual specifications. Such a diverted flow shall be restored to the natural stream course as soon as practicable. Stream channels impacted by construction activity will be restored to their natural grade, condition, and alignment.

PRACTICE 15.21 - *Maintenance of Roads*

OBJECTIVE: To conduct regular preventive maintenance operations to avoid deterioration of the roadway surface and minimize disturbance and damage to water quality, and fish habitat.

EFFECTIVENESS: Moderate

COMPLIANCE: Meets FPA Rules

IMPLEMENTATION: For roads in active timber sale areas standard TSC provisions require the Purchaser to perform or pay for road maintenance work commensurate with the Purchaser's use. Purchaser's maintenance responsibility shall cover the before, during and after operations period during any year when operations and road use are performed under the terms of the Timber Sale Contract. All maintenance work shall be done concurrently, as necessary, at least to the following minimum standards:

1) Culverts and ditches shall be kept functional.
2) During and upon completion of seasonal operations, the road surface shall be crowned, out-sloped, in-sloped or waterbarred, and berms removed from the outside edge except those intentionally constructed for protection of fills.
3) The road surface shall be maintained as necessary to minimize erosion of the sub-grade and to provide proper drainage.
4) If road oil or other surface stabilizing materials are used, apply them in such a manner as to prevent their entry into streams.
5) Sidecast of all material associated with road maintenance will be done in a manner to prevent its entry into streams.
6) Slumps, slides and other erosion features causing stream sedimentation will be kept repaired and stabilized.

PRACTICE 18.02 - Formulation of Fire Prescriptions
PRACTICE 18.03 - Protection of Soil and Water form Prescribed Burning

OBJECTIVE: To maintain soil productivity, minimize erosion, and prevent ash, sediment, nutrients and debris from entering surface water.

EFFECTIVENESS: High

COMPLIANCE: No Related FPA Rule

IMPLEMENTATION: IMPLEMENTATION: Forest Service and/or other crews are used to prepare the units for burning. This includes water barring firelines and reducing fuel concentrations. The interdisciplinary team identifies Riparian Areas and soils with water repellant tendencies as part of the environmental analysis. Some of the techniques used to prevent soil erosion and water quality degradation are:(1) construct water bars in fire lines; (2) reduce fuel loadings in drainage channels; (3) maintain the integrity of the Riparian Area; (4) avoid intense fires, which may

promote water repellency, nutrient leaching, and erosion; (5) retain or plan for sufficient ground cover to prevent erosion of the burned sites and (6) removal of all debris added to stream channels as a result of prescribed burning, unless debris is prescribed to improve fisheries habitat.

1) Foaming agents will not be used for water control lines where any of the ephemeral channels could carry the material to intermittent or perennial streams.
2) Machine constructed firelines will not be used on the sensitive landtypes
3) Firelines must be frequently waterbarred (not to exceed 50 foot spacing when going up and down the hill).
4) Maintain large organic debris appropriate to the habitat type (see "Managing Coarse Woody Debris in the Forests of the Rocky Mountains" by Graham et. al. 1994).
5) Limit prescribed burning to those times when surface soil moisture is above 25 percent to reduce the potential for damage from hot burns.

Glossary Of Silvicultural Prescriptions

A. Intermediate Treatments

Treatments designed to enhance growth, quality, vigor, and composition of the stand after establishment or regeneration and prior to final harvest.

- **Thinnings**

1. **Precommercial Thinning (PCT) -** Thinnings made purely as investments in the future growth of stands so young that none of the felled trees are extracted and utilized. The trees to be cut or retained are chosen on the predetermined basis or pattern with little or no regard for their position in the crown canopy. This technique can often be used in young stands that have not been thinned previously and are densely crowded. The arbitrary basis on which the trees are selected is justified in highly uniform stands that have not differentiated into crown classes (Smith, 1962).

2. **Sub-commercial Thinning (SCT) -** The intent of sub-commercial thinning is basically the same as precommercial thinning, i.e., an investment in the future growth of young stands. In sub-commercial thinning trees cut are normally between 3 inches and 6.9 inches d.b.h. All trees 7.0 inches d.b.h. and larger (i.e., those meeting typical sawlog standards) are left for later treatment. However, with sub-commercial thinning the felled trees are removed and utilized as posts, tree stakes or fiberwood (pulp, chipboard, etc.). Specifications for trees to be removed can be set up on standard spacing, or based on live crown ratios of the trees to be harvested. For example, the prescription may call for all coniferous species that have live crown ratios of less than 40% to be removed.

3. **Commercial Thin (CT) -** Intermediate harvest that does not result in regeneration. Used primarily with even-age systems prior to regeneration harvest, but would not eliminate opportunity to convert stand at a later date to uneven-age systems. The primary objectives of a commercial thinning are to stimulate growth of the residual stand, increase total yield, and utilize material that is suppressed. Treatment would remove approximately 1/3 of the stand, leaving larger trees evenly spaced with crowns free to grow before canopy closure occurs again.

4. **Basal Area Thinning (BAT) -** Intermediate harvest designed to reduce predominantly lodgepole pine stand susceptibility to infestation of mountain pine beetle by increasing bole temperatures. Treatment will remove up to 50% of the stand, leaving 80 to 90 square feet of basal area per acre. Larger trees will be left evenly spaced. Treatment is not designed to result in regeneration, however, some may occur. This treatment has been used successfully on the Flathead National Forest to reduce mortality in stands in the vicinity of mountain pine beetle epidemics.

- **Stand Improvement Treatments**

1. **Improvement Cutting (IC) -** The removal of less desirable trees of any species in a stand of poles of larger trees, primarily to improve composition and quality.

2. **Sanitation Salvage (SS) -** The removal of trees to improve stand health by stopping or reducing actual or anticipated spread of insects and disease (**sanitation).** The removal of dead trees or trees being damaged or dying due to injurious agents other than competition, to recover value that would otherwise be lost (**salvage)**.

- **Release Treatments**

1. **Liberation Cutting (LC) -** A release treatment made in a standnot past the sapling stage to free the favored trees from competition with older, overtopping trees.

B. Regeneration Methods

A cutting method by which a new age class is created. Four regeneration methods often used in the Western U.S. are **Clearcutting, Seed Tree, Shelterwood**, and **Selection**.

- **Even-Aged Methods**

Methods designed to regenerate a stand with a single age class. For all of these types of cuttings any overwood trees are removed after regeneration is established.

1. **Clearcut (CC)** - the cutting of essentially all trees, producing a fully exposed microclimate for development of a new age class.

2. **Seed Tree (ST)** - the cutting of all trees except those for a small number of widely dispersed trees retained for seed production and to produce a new age class in a fully exposed microenvironment.

3. **Shelterwood (SW)** - the cutting of of most trees, leaving those needed to produce sufficient shade to produce a new age class in a moderated microenvironment..

- **Two-aged Methods**

Methods designed to maintain and regenerate a stand with two age classes due to the long-term retention of reserve trees in the stand.

1. **Clearcutting with Reserves (CCR)** - A clearcutting method in which varying numbers of reserve trees are not harvested to attain goals other than regeneration.

2. **Seed Tree with Reserves (STR)** - A seed tree method in which some or all of the seed trees are retained after regeneration has become established to attain goals other than regeneration.

3. **Shelterwood with Reserves (SWR)** - A variant of the shelterwood method in which some or all of the shelter trees are retained, well beyond the normal period of retention, to attain goals other than regeneration.

- **Uneven-aged (Selection) Methods**

Methods of regenerating a forest stand, and maintaining, an uneven-aged structure, by removing some trees in all size classes either singly, in small groups, or in strips.

1. **Group Selection (GS) -** A method of regenerating uneven-aged stands in which trees are removed, and new age classes are established, in small groups. (Note: The group selection method is often confused with the clearcutting method. However, with the clearcutting method the entire stand is regenerated with one entry and with the group selection method the stand is regenerated through a series of evenly timed cutting cycles. For example, given a 100 acre stand and a 25-year cutting cycle, approximately 1/4 of the stand, or 25 acres, would be regenerated every 25 years. The size of the groups would vary depending on regeneration objectives, but generally would range from 1-5 acres. With the clearcutting system the entire 100 acre stand would be regenerated with one entry).

2. **Group Selection with Reserves (GSR)** - A variant of the group selection method in which some trees within the group are not cut to attain goals other than regeneration within the group.

3. **Single Tree Selection (STS)** - A method of creating new age classes in uneven-aged stands in which individual trees of all size classes are removed more-or-less uniformly throughout the stand to achieve desired stand structural conditions.

- **Other Methods**

1. **Irregular Shelterwood (ISW)** - A regeneration method characterized by variation in age structure (usually uneven-aged) or in spatial arrangement of trees..
2. **Shelterwood Prep Cut (SWP)** - An optional preparatory cut designed to enhance conditions for seed production.

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Appendix F - Response to Comments

F.1 Introduction

This appendix contains the substantive comments received on the Supplemental Draft EIS (SDEIS) for the Mission Brush project and the agency's responses to those comments. The full comments (letters, records of phone calls or personal visits, e-mails and faxes or other formats) are part of the public record and are included in the Mission Brush project file located at the Bonners Ferry Ranger Station.

Public review of the SDEIS and the following substantive comments did not disclose any new issues or need for new significant analysis. Chapter 1 of the SFEIS discusses other changes between the release of the 2004 Final EIS and Record of Decision and the release of the 2005 Supplemental DEIS and 2006 Supplemental Final EIS and Record of Decision.

How to read this appendix:
Comments are displayed in italicized text and designated by the resource category (**F.2 Old Growth**), followed by a number for the individual comment (**F.2-a**). The agency's response is designated as **Response** and appears in normal text style.

For example:

F.2-a Comment:
The SDEIS provides no information on the precision ….
Response: The IPNF is currently using two independent tools …..

F.2 Old Growth substantive comments and responses

F.2-a Comment:
The SDEIS provides no information on the precision, amount of error, based on its inventory, neither in the project area nor forestwide. Block size of old growth habitat, between-block forest integrity, and spatial juxtaposition are some important considerations ignored by the SDEIS.

Response: The IPNF is currently using two independent tools to inventory and monitor old growth at the Forest-wide scale. These are:

1) Forest Inventory and Analysis (FIA) data.
2) IPNF stand level inventory, with old growth status recorded in TSMRS database.

These two independent inventories use significantly different sample designs, and are administered and carried out by different people. FIA old growth estimates are based on a statistically sound, systematic sample of the entire National Forest, administered by the Rocky Mountain Research Station in Ogden, Utah. Our stand level inventory is based upon examination of selected individual forest stands for old growth characteristics. This stand level inventory is carried out by IPNF Ranger District personnel.

The two independent Forest Service old growth inventories produce remarkably similar results:

- Based on FIA data, the current estimate of the proportion of old growth on the forested portion of the IPNF is 12.85%. The 90% confidence intervals of this estimate are 10.55% to 15.27%.
- The IPNF stand level inventory of allocated old growth is 12.1% of forested lands.

The stand level inventory amount is well within the 90% confidence interval of the FIA inventory. From statistical perspective, at the 90% confidence level, the two numbers are not significantly different. Together, these two inventories offer compelling evidence that the IPNF is meeting Forest Plan standards for the amount of old growth to be retained.

Additionally, the District reviewed all of the stands in the project area that are considered part of the IPNF's allocation. First, all allocated old growth stands (codes 9 and 11) were reviewed to determine if they do indeed meet standards. Second, all stands coded as recruitment (code 8) were also reviewed to determine whether they meet standards and finally, any stand with a size class origin year of 1880 or earlier was reviewed to determine if it met old growth standards. Each stand that was reviewed was measured against the Green et al (1992) standards for a given old growth type and given the appropriate TSMRS code. The date of the latest exam was noted and any significant disturbances that could have changed the character of the

stands were noted. Any stands coded as allocated confirmed old growth (code 9), or allocated potential old growth (code 11), with a harvest activity code in the database *since* the most current stand exam was field reviewed in 2005. Wildfire and insect and disease outbreaks are other factors that could have potentially changed the condition of our allocated growth stands. There have been no wildfires of any significance within the project area since these stands were last field reviewed and annual Region One insect and disease aerial flights revealed that there have been no significant outbreaks that would have altered stand conditions enough to warrant a change in their allocation. Other questionable stands, whether they were previously included in the allocation, or not included, were also field examined in 2005. In all, more than 1,100 acres (36 stands) were field reviewed in 2005, which is about 57% of the allocated old growth in the project area. The review determined 12.1% of the project area consists of allocated old growth.

Spatial integrity of old growth is addressed in IPNF standards 10 (b) and (c). Standard 10 (b) addresses distribution at the Forest level and standard 10 (c) addresses distribution at the OGMU, or project level. Patch size is addressed with standard 10 (f). The manner in which each of these old growth standards, and all other old growth standards, are addressed is discussed in the SFEIS (Chapter 4, section 4.4).

F.2-b Comment:
How much old growth has been logged since the Forest Plan was signed and prior to the signing?

Response: Our database records show that 115 acres have been harvested in old growth since 1987. These treatments were improvement and sanitation salvage cuts on dry forest habitats. Less than 50% of the acreage in these stands was harvested (115 out of 245 acres). Additionally, these stands were surveyed in 2005 and it was determined that they have enough old growth character to be considered potential old growth (TSMRS code "11") and the stands are included in the IPNF's old growth allocation.

Our records also show that 202 acres of moist forest old growth was harvested prior to 1987. These sanitation salvage treatments focused on the removal of blister rust-infected western white pine and mistletoe-infected western larch. These treatments occurred in 1985 and filed exams have subsequently been conducted in 1991, 1994, 2003, and 2005 in the treated stands. These exams determined that these previously harvested stands meet the old growth criteria for Green et al (1992) established for the IPNF.

Our database does not track the prior structure of the stands that were previously regenerated using even-aged silvicultural systems (clearcut, seed tree, shelterwood, etc.) It is possible that some acres of old growth were regenerated using these systems and the stands no longer qualify as old growth, just as we are not sure how much old growth burned up in the 1926 and 1945 fires in the project area, or any other fire. What we do know, based on the District's project level old growth review, is that OGMU's 19 (13%) and 20 (12%) meet the IPNF's standard for 5% old growth per OGMU. Additionally, according to the IPNF's FIA data and stand level inventory forest-wide old growth is over 12%. In short, the District has demonstrated compliance with the IPNF's old growth standards.

No even-aged regeneration harvesting is being proposed in old growth under the Mission Brush EIS. Only entry into dry forest old growth is proposed with the intent to improve structure and composition of the residual stand; in other words, the focus is on the character and structure of the residual stand, not the trees being removed.

F.2-c Comment:
The SDEIS does not disclose if all areas to be logged and surveyed have been field surveyed.

Response: All of the stands that are part of the IPNF's allocation, and scheduled for harvest and prescribed burning, were surveyed in 2005, with the exception of one stand that was surveyed in 1994. The original field exam was reviewed as part of the old growth verification process for the Mission Brush project and no disturbance was noted in the stand (harvest, insects, disease, fire, etc.) that would warrant a change in its allocation. A complete record of the entire old growth review is part of the project file.

F.2-d Comment:
Why does the IPNF assume that 10% is all that is needed to maintain viable populations of old-growth species on the Forest?

Response: It is beyond the scope of this project analysis to assess whether the 10% old growth standard for the IPNF is scientifically valid. We are required to follow the IPNF's standards for old growth management. Each of these standards and the manner in which the Mission Brush EIS complies with the standards are discussed in Chapter 4 (section 4.4-B).

F.2-e Comment:
The FS has failed to site any evidence that its managing for old growth habitat strategy will improve old growth species habitat over the short-term or long-term.

Response: A study of historic structure and composition in stands with dry forest habitat types similar to those found in the Mission Brush project area show that prior to 1900 these stands supported 27 large (20" DBH) TPA and 43 greater than 3" DBH (Habeck 1990). This would equate to a basal area of about 70-80 ft^2 of basal area for trees larger than 3" DBH. In 1984 stands had 211 TPA > 3" DBH. On similar stands in western Montana fires at mean intervals of *less than 50 years* account for presence of old growth ponderosa pine (Arno and others 1995). Average fire return intervals varied 10-50 years. Longer intervals favor Douglas-fir and grand fir. *All-aged* structures were produced by non-lethal fire regimes. *Even-aged* structures by fire regimes with a combination of non-lethal, and patchy severe fire.

Arno et al (1995) and Arno et al (1997) studied influences of fire on dry forest old growth stands on several forests in western Montana and determined that pre-1900 basal areas averaged less than 100 ft^2 of basal area on seven out of ten old growth stands that were sampled, with a low of 57 ft^2 and high of 152 ft^2. The mean increase in basal area for stands without extensive overstory mortality was over 76% since 1900 with a range of 23-144%.

Harrington (1991) stated that reintroducing fire alone will not restore most old growth stands because of unprecedented accumulations of duff and ladder fuels. The dense understories, including many trees whose crowns extend into the overstory canopy cannot now be killed by fire without damaging the old growth trees. Arno and Fiedler (2005) state that old trees need relatively open conditions to maintain modest growth rates and survive several hundred years. Low-vigor trees are unable to marshal enough resources to maintain adequate defense. Large trees growing in a dense layer of smaller trees are especially vulnerable to attack, underscoring the importance of maintaining reasonable growth rates. Treatments in and old growth larch and ponderosa pine stand on the Lolo NF in the late 1990's reduced basal area about 16% from 144 to 121 ft^2 per acre using the least intensive treatment, compared to the most intensive treatment that reduced basal area by about 48% from 145 to 76 ft2. Results three years later showed old growth trees had increased sap flow, higher foliar nitrogen content, and higher foliage production (Sala and Calloway 2001), indicating improved tree vigor and increased resistance to insects and disease. The treatments in dry forest old growth in the Mission Brush project are similar in nature to those described in the Lolo NF example.

F.3 Invasive Plant Species (Noxious Weeds)

F.3-a Comment:
The Forest Plan never anticipated nor disclosed the degree to which land management activities, including timber production, grazing, and management of recreational activities, would lead to so much of the IPNF being infested with noxious weeds. The Sheep Creek Salvage FEIS (Beaverhead-Deerlodge NF, 2005) states at p. 173: Noxious weed presence may lead to physical and biological changes in soil. Organic matter distribution and nutrient flux may change dramatically with noxious weed invasion. Spotted knapweed (Centaurea biebersteinii D.C.) impacts phosphorus levels at sites (LeJeune and Seastedt, 2001) and can hinder growth of other species with allelopathic mechanism. Specific to spotted knapweed, these traits can ultimately limit native species' ability to compete and can have direct impacts on species diversity (Tyser and Key 1988, Ridenour and Callaway 2001).

The FS has no idea how the productivity of the land been affected in the project area and forestwide due to noxious weed infestations, nor how that situation is expected to change.

Response: The IPNF response to invasive plant species (noxious weeds) is outlined in the Forest Plan; the success of the management activities is evaluated through monitoring. The Bonners Ferry Ranger District's management of weeds is outlined in the district's Noxious Weed Management EIS. Details of these items are described below.

IPNF Forest Plan - The overall strategy for the Idaho Panhandle National Forests (IPNF) is to contain weeds in currently infested areas and to prevent the spread of weeds to susceptible but generally uninfested areas. The IPNF also attempts to eradicate small infestations in generally uninfested areas. The IPNF has had a weed management strategy in place since the Final EIS for Weed Pest Management, Idaho Panhandle National Forests was completed in 1989 (USDA, Bonners Ferry Weed EIS, p. 1-8). The Integrated Weed Management document is contained in Appendix A of the Bonners Ferry Ranger District Final EIS for Noxious Weed Management Projects.

The IPNF Forest Plan provides the objective of noxious weed control based on integrated pest management conducted in cooperation with counties, other agencies, and private landowners. During development of the Forest Plan, the decision was

made to use Integrated Pest Management (IPM) principles in managing various pests. This decision, derived from regulations implementing the National Forest Management Act (NFMA 36CFR 219.27(3)), calls for the use of IPM when dealing with forest pests. At the site-specific project level, weed control is conducted under the Bonners Ferry Ranger District's Final EIS and Record of Decision for Noxious Weed Management Projects dated 9/16/1995 (USDA, Bonners Ferry Weed EIS, p. 1-7).

Forest Plan Monitoring Report - The 1998 Forest Plan Monitoring and Evaluation Report discusses the development of the Panhandle Weed Management Area (PWMA). The need for a comprehensive multi-landowner program was evident when the 1998 Summary of Noxious Weeds on National Forests listed the IPNF with infestation on 248,800 acres. Members of the PWMA are a multi-state, multi-agency and multi-county based group dedicated to the control and management of weeds. Twenty cooperative partners operate through three subgroups lead by a multi-agency steering committee, under a signed Memorandum of Understanding. In 1998, Final EISs and Records of Decision were completed for noxious weed control on the Bonners Ferry, Sandpoint and Priest Lake Ranger Districts; the Coeur d'Alene River and St. Joe Ranger Districts were the next to develop EISs for weed control. (USDA, IPNF 1998 Monitoring Report, p. 142)

District Weed FEIS - The Bonners Ferry Final EIS for Noxious Weed Management Projects (BFRD Weed FEIS) included inventory, mapping and an activity schedule for significant weed plant communities, as directed by IPNF objectives (BFRD Weed FEIS, pp. 3-2, 2-6, 2-7). Analysis of the No Action alternative describes the ways that noxious weed infestations affect the productivity of the land and uses of National Forest System lands. The analysis of the action alternatives explains the ways that situation would be expected to change under the various alternatives.

As described in the BFRD Weed FEIS, "without treatment it becomes increasingly likely that noxious weeds will become more widely established across the Bonners Ferry Ranger District. …an indirect effect of noxious weed invasion could be increased water runoff and sediment yield from infested sites. Lacey et. al. (1980) have shown an almost three-fold increase in sediment yield from knapweed sites compared to a non-infested bunch grass site. Runoff increased by about 50 percent from the knapweed site.

At the present time, most infested sites are along road clearings. Noxious weeds are probably having little effect on sediment yield in comparison to other road related activities (road use, maintenance, etc.). Impacts from future spread of the weeds would depend on the slope, soil characteristics, precipitation patterns, and distance to water from the infested sites. However, even under the worst-case scenario, it is unlikely that increase in sediment yield to streams would be sufficient to affect fisheries or water quality." (BFRD Weed FEIS, pg. 4-2)

"Range – No Action Alternative The increasing spread of noxious weeds would lead to a reduction of available forage for both livestock and wildlife." (BFRD Weed FEIS, p. 4-9)

"Recreation – No Action Alternative The spread of noxious weeds could negatively impact the recreational use and enjoyment of the Cabinet, Purcell, and Selkirk Mountain ecosystems. For many people the presence of noxious weeds is evidence of negative human impact and negligence in stewardship of natural resources." (BFRD Weed FEIS, p. 4-10)

"Soils and Groundwater Quality – There is some evidence that erosion rates are higher on knapweed-infested ground than on native grassland sites." (BFRD Weed FEIS, p. 4-10)

"Vegetative Community Diversity – No Action Alternative Under this alternative the knapweed, Canada thistle, hawkweed, dalmation toadflax, skeleton weed, goatweed, and other noxious weed infestations would be allowed to expand without interference. … As these noxious weeds spread, the negative impact on the diversity of native vegetation would become more apparent. Several researchers have also demonstrated that the number of native species, not just their total biomass, decreases on sites infested by noxious weeds. Belcher and Wilson (1989) found 7 to 11 species outside leafy spurge infestations, but only 4 species where leafy spurge was most abundant. Tyser and Key (1988) reported significant reduction in species richness and diversity in knapweed-infested fescue grassland surveyed in Glacier National Park." (BFRD Weed FEIS, p. 4-11)

"Wildlife and Threatened and Endangered Species – No Action Alternative … would have no direct impact in the short term on [TES] or on wildlife species in general. …[it] could however, in the long term as more native habitat is replaced or reduced by noxious weeds. The listed species most affected by this would be herbivorous, such as grizzly bears, and wolves who depend on prey that are herbivorous. Of particular concern is the impact on grazing animals such as deer and elk. … noxious weeds can effectively supplant native vegetation on infested sites." (BFRD Weed FEIS, pg. 4-13)

Effected wildlife could include the following: 1) Elk and white-tailed deer, by reduction in the amount of available preferred grazing plants; 2) Wolves, and other carnivores, if their prey base declines; 3) Grizzly bears, if succulents were overrun by noxious weeds (although they are opportunists so they would probably be able to survive well, even with a severe infestation).

Other wildlife, including birds, would be affected in different ways depending on whether they are herbivorous or granivorous. (BFRD Weed FEIS, p. 4-14 and Appendix E)

Project Area: Current Weed Infestations, Treatments, Future Plans

The Mission Brush weeds report (project file document xxxx) describes the current situation as follows:
"Noxious and undesirable weeds are currently infesting several sites in the project area. The following weeds have been observed primarily along roads (both open and closed) in the project area:

Absinthe wormwood (*Artemesia absinthe*)
spotted knapweed (*Centaurea maculosa*)
Canada thistle (*Cirsium arvense*)
sulfur cinquefoil (*Potentilla recta*)
bull thistle (*Cirsium vulgare*)
meadow hawkweed (*Hieraceum pratense*)
goatweed (*Hypericum perforatum*)
common tansy (*Tanacetum vulgare*)
oxeye daisy (*Leucanthemum vulgare*)

The heaviest infestations occur on roads in intermingled ownership (FS road 2217 and lower portion of FS 272) and on closed spur roads in the lower portion of Mission Creek. In some areas, meadow hawkweed, thistles, and spotted knapweed have spread off the road prism. While weed infestations in the lower portion of Mission Creek are heavy, the upper portion of the drainage and the Hall Mountain area are considered relatively weed free. Weed infestations are also much lower in the Brush Lake area (FS road 1004, FS road 2485 and FS road 397); following several years of monitoring and treatment, weed populations on FS 1004 in particular have been reduced to "almost negligible levels" (see project file).

The project file contains a map showing heavily infested and relatively weed free areas within the project area. Under all action alternatives, cleaning of all off-road equipment would be required before moving from heavily infested to relatively weed-free areas."

The Mission Brush report on Noxious Weed Status describes the past and existing conditions of weeds in the project area and the general plans for future activities (SFEIS Appendix B, section A-6). The report is summarized as follows:

South Hall Mtn road system: Segments pass through intermingled ownership; has been treated; see the report for detailed information. The pre-existing conditions of this area established it as an area of lowest priority due to the size and extent of the populations, the migration off-road, and lack of cooperating treatments by other managers.

Upper Hall Mtn. & Mission/Harvey road system: segments pass through intermingled ownership. Only the main road has received annual treatment; priorities have focused on preventing seed migration on open roads. See the report for detailed information.

Brush Lake, Tungsten, Coyote and Highway 95 road system: Treatments to the Brush Lake road system have been very successful. Other areas have been treated with mixed success. See the report for details. No treatments are conducted on National Forest Systems Lands along Highway 95 because the Idaho Department of Transportation treats their right-of-way every three years and the Forest Service is concerned with potential for over application and other safety issues if the treatments were to overlap. Future applications in all areas will focus on campground roads, then open roads that access high use sites, then other sites as overall program objectives allow.

F.4 Vegetation – Ecosystem Management

F.4-a Comment:
The Abstract states, "The objectives of the project are to ***begin*** *restoring forest health and wildlife habitat, improve water quality and overall aquatic habitat by reducing sediment and the risk of sediment reaching streams…" (Emphasis added.) Using this model of ecological restoration as represented by the SDEIS, how much more logging and burning will the FS have to undertake in these watersheds before the areas are fully functioning ecologically?*

Response: Ecological restoration activities are dynamic ongoing processes linked to the rate of change within the vegetative and aquatic communities, their succession patterns, and relative health. Refer to Chapter 3 Sections 3.4, 3.5, 3.6, 3.7, 3.8, and 3.9 in the SFEIS for a description of the various resources. Management activities are guided by the IPNF Forest Plan and the regulatory framework also discussed for each resource in Chapters 3 and 4. Effects to the various resources are described in the following sections of the SFEIS: vegetation, 4.3; old growth, 4.4; aquatics, 4.5; wildlife 4.6; recreation, 4.7.

F.4-b Comment:
Any forest condition that is maintained through mechanical manipulation is not maintaining ecosystem function. The proposed vegetation management activities would not be integrated well with the processes that naturally shaped the ecosystem and resulted in a range of natural structural conditions. Thus, the need for standards guiding both the delineation of zones where

"artificializing" fuel reduction actions may take place, and that also set cut tree size limits and snag and down woody debris retention amounts.

Response*:* The purpose and need for this project is discussed in Chapter 1 of the SFEIS and included consideration of information from a number of scientific assessments from the broad-scale Interior Columbia Basin Ecosystem Management Project down to the more site-specific North Zone Geographic Assessment and this assessment of the Mission Brush project area (SFEIS, Chapter 1 section 1.5). The desired future conditions of the area are described in section 1.6 of the SFEIS.

Alternative 7, that would have utilized limited mechanical manipulation of the vegetation, was considered but eliminated from detailed study. This alternative looked at two methods other than timber harvest that could be employed to meet the goals and objectives of this project. The first method involved conducting prescribed burns in the stands without any site preparation, with burn temperatures hot enough to kill the majority of the seedling and sapling size trees and about one-fourth of the pole and sawlog size trees. For such a burn to be effective, the weather and fuel conditions would have to be very dry. Consequently, the risk of an escaped fire next to private land would be high. The second method would have included felling of some unwanted trees, followed by prescribed burning. Although this could have been done under more moist conditions that the first method, the number of acres involved and the proximity to private lands, it would still have been risky. (SFEIS section 2.5 c)).

The policy direction and legal framework for this project are outlined in section 1.7-B of Chapter 1, including Forest Plan direction for managing public lands in section 1.7-B.3 d. Section 2.8 of the SFEIS discloses the specific criteria that must be applied during implementation of any action alternative. The purpose of these measures is to avoid, or to the fullest extent possible, minimize the potential for adverse effects to the resources. Coarse woody debris requirements are shown in section 2.8-A.2 d), timber harvesting in section 2.8-A.2 e), and slash disposal in section 2.8-A.2 f), wildlife tree retention (snags) in section 2.8-A.4. The silvicultural treatments that would be used are described for each alternative in Chapter 2 (tables 2-8, 2-10, and 2-12).

F.4-c Comment 3

Many adverse consequences to soil, ecological processes, wildlife, and other elements of the natural environment are associated with logging, including thinning. (Ercelawn, 1999; Ercelawn, 2000.) For example: "Salvage or thinning operations that remove dead or decayed trees or coarse woody debris on the ground will reduce the availability of forest structures used by fishers and lynx." (Bull et al., 2001.)

Response*:* The effects of treating the stands have been identified and mitigated, as described in Chapter 2 of the SFEIS, by actions such as:

- avoiding sensitive areas,
- timing restrictions,
- use of Best Management Practices (BMPs),
- leaving snags and down woody material, and
- riparian buffers.

Fisher and lynx habitat (i.e. denning) were visited in the field and the habitat distribution was analyzed for the project. The current condition and corresponding effects of the proposed action are disclosed in wildlife sections of Chapters 3 and 4 of the SFEIS.

F.5 Soils

F.5-a Comment:

We are concerned that project activities will accelerate soil erosion, increase soil compaction, and degrade soil productivity. Prescribed fires and mechanical treatments may adversely affect soil productivity. NFMA requires the FS to "not allow significant or permanent impairment of the productivity of the land." [36 C.F.R. § 219.27(a)(1).] NFMA requires the FS to "ensure that timber will be harvested from National Forest System lands only where—soil, slope, or other watershed conditions will not be irreversibly damaged." [16 U.S.C. 1604 (g)(3)(E).]

Response: All proposed cutting units were field-surveyed using techniques outlined in the Northern Regional Soil Quality Standards. All units except Unit 16 currently meet the soil standards (SFEIS, Appendix A section A.4 and Table A-7). Unit 16 has a detrimental soil compaction value of 16 percent; the Regional Standard is 15 percent. Under Alternative 2, Unit 16 would be rehabilitated in order to move it toward meeting the Region 1 standards (SFEIS, section 2.8). The SFEIS discusses irreversible and irretrievable commitment of resources, and unavoidable adverse effects, including impact to soil productivity,

as required by NEPA (SFEIS section 4.8). Features designed to protect soils are listed in the SFEIS section 2.8. The soil analysis is in compliance with the Forest Plan, NEPA, NFMA, and the Regional Soils Standards.

The Soil Resources Report is included in section A-4 of Appendix A.

F.5-b Comment:
The FS has essentially admitted that it is in the dark as far as doing scientific research on soil productivity changes following management activities. In response to comments on the Black Ant Salvage DEIS, Lewis & Clark NF, USDA Forest Service, 2002 states:
Soil Quality Standards "provide benchmark values that indicate when changes in soil properties and soil conditions would result in significant change or impairment of soil quality based on available research and Regional experience" (Forest Service Manual 2500, Region 1 Supplement 2500-99-1, Chapter 2550 – Soil Management, Section 2554.1).

The Forest Management Handbook at FSH 2509.18 directs the FS to do validation monitoring to "Determine if coefficients, S&Gs, and requirements meet regulations, goals and policy" (2.1 – Exhibit 01). … The Ecology Center recently asked the Northern Region if they have ever performed this validation monitoring of its 15% Standard, in their February 26, 2002 Freedom of Information Act request to the Regional Forester, requesting … all documentation of validation monitoring by the Forest Service in the Northern Region that answers those two questions.

The Northern Region office's reply letter stated that there is no documentation that responds to this request. If the IPNF is aware of any new or other documentation that would respond to this request, we ask that you please disclose it to us now.

Response: The IPNF Forest Plan Monitoring item K-1 address Prescriptions and Effects on Land Productivity. The Forest Soil Resource objectives are described as follows: "… to maintain and restore long-term productivity, to support healthy vegetative communities and protect watersheds. Key elements of maintaining long-term soil productivity include retaining surface organic layers, surface volcanic ash, and the bulk density of the surface volcanic ash within natural ranges of variability." (IPNF 2001 Monitoring Report, pg 51)

The 2000 Monitoring Report includes monitoring information from the Kat-tail timber sale on the Bonners Ferry Ranger District. "Unit 1 on the Kat-tail timber sale had 14 percent detrimental compaction. This unit meets Regional and Forest Plan soil quality standards from a soil compaction standpoint. The Kat-tail unit also met the fine organic matter guidelines but was low on the coarse woody debris guidelines. …This unit appears to have a lot of coarse woody debris left on the ground, but because most of the woody material is 3 to 4 inches in diameter the overall tonnage came up low." (IPNF 2000 Monitoring Report, pg 54)

The 2001 Monitoring Report includes monitoring information from the Along Haul Salvage timber sale on the Bonners Ferry Ranger District. Units 2 and 3 were tractor logged, lopped and piled. "Units 2 had 12 percent and Unit 3 had 14 percent detrimental compaction. These units met Regional and Forest Plan soil quality standards from a soil compaction and displacement standpoint. The Along Haul Salvage Units also met the fine organic matter guidelines but was low on the coarse woody debris guidelines." (IPNF 2001 Monitoring Report, pgs 53-54)

The 2002 Monitoring Report included a past horse logging operation in Units 1, 6 and 8 of the Dry Wall project on the Bonners Ferry Ranger District. "Units 1, 6 and 8 on the Dry Wall project had an average of 1.5 percent detrimental impacts. These units meet Regional and Forest Plan soil quality standards." (IPNF 2002 Monitoring Report pg 60)

F.5-c Comment:
The SDEIS relies upon mitigation for soils, but cites no monitoring or scientific studies to validate the effectiveness of the mitigation.

Response: See SFEIS section 2.8 and Appendix A section A.4. The IPNF 2003 Monitoring for Soil Resources (pages 75-77) evaluated past projects (1970 – 1995) on the Avery/St Joe and Priest Lake Ranger Districts, focusing on the following items:

- Soil condition
- Large organic matter
- Best Management Practices effectiveness monitoring
- Fine organic matter
- Coarse woody debris
- Soil displacement
- Soil compaction

Project areas on the St. Joe Ranger District met Regional and Forest Plan soil quality standards. Values for large organic material ranged from 5 tons/acre to 52 tons/acre with half of the units meeting or surpassing the standard of 30 tons/acre and half falling below the standard. The BMP effectiveness showed 8 units with overall effectiveness of 90-98 percent, 4 units between 80-90 percent and one unit at 70 percent (the year of the logging practices was not specified in the Monitoring Report but could have been a factor in the effectiveness of the BMP measures.)

Thirteen stands in the Kalispell Timber sale on Priest Lake Ranger District were monitored for fine organic matter, coarse woody debris, and soil displacement and compaction. Fine organic matter on all units surpassed the suggested minimum; coarse woody debris was within standards on five units, surpassed levels in six and was below optimum limits in one stand; two of the 13 stands had detrimental impacts (10% and 9% compaction) but met Regional and Forest Plan soil quality standards.

Past Forest Plan Monitoring and Evaluation Reports (1990 to present) indicate skyline and helicopter logging increases detrimental compaction by an average of 2% and winter tractor skidding over snow averages less than 5%. In units lacking an existing trail system; mitigation measures say any new skid trails must average 100 feet apart except where terrain dictates otherwise in the FEIS (page 2-47) and (Niehoff, 2002)

Where skid trails exist from previous operations, the amount of additional detrimental soil compaction is dependant on the following factors:

a) Existing landings and skid trail patterns will be used to provide access to most of the area within the units. Extensions or branches from existing skid trails in the units is usually projected to be 0 to 8% per unit area; depending on the amount of new trail extensions, type of equipment, rock content in the soil, and the timing of operations.
b) Detrimental soil compaction is mitigated by running equipment over frozen or rocky soils, a snow layer greater than 18" in depth, or a slash mat in the skid trails (monitoring report - Niehoff). These practices will be used in the implementation of the Mission Brush EIS.
c) In accordance with Region 1 soil guidelines, those units (i.e. #16), with existing detrimental soil compaction over 15%, will have the surplus skid trails decompacted, trending the unit back to a net improvement regarding the amount of detrimental soil compaction, displacement or rutting.

As stated in the SFEIS (Chapter 2, sections 2.8 A-1 j) and 2.8 A-2 d)) the design criteria and mitigation measures for this project have been shown to be highly or highly-moderately highly effective, with one item rated as low-moderately effective, in reducing impacts to the soils in managed areas.

F.5-d Comment:
The SDEIS fails to disclose the implications of landtype limitations for detrimental soil impacts. Some of the landtypes have "moderate" or "severe" soil erosion and sediment hazard potential, and soil erosion or mass wasting (a severe form of erosion) are both kinds of detrimental impacts. And the public cannot tell which proposed activity areas fall into which landtypes, and therefore might be more at risk for erosion or other detrimental impacts that decrease soil productivity. Finally, the SDEIS fails to disclose the results of monitoring of past actions on these various landtypes, that would reveal the differential levels of soil impacts of the various logging activities carried out in the past (and now proposed with this new project). The SDEIS fails to link the current and cumulative soil disturbance across hundreds or thousands of acres in the project area watersheds to the impacts on water quantity and quality.

Response: The sensitive landtypes in the project area have been identified. The project hydrologist and a geomorphologic engineer surveyed the sensitive landtypes on the ground and used the "LISA" model to identify the risk levels of mass failures with respect to slope and canopy cover removal. Areas prone to mass failure were avoided using standard INFISH guidelines. Units on sensitive landtypes (steep slopes) were limited to thinning only with no ground disturbance such as road building. Cumulative effects of implementing an action alternative on these landtypes are evaluated in the Aquatics discussion of Chapters 3 and 4 of the SFEIS (see sections 3.6-D and 4.5).

Also, refer to the above responses for the post harvest soil monitoring information on the forest and discussions within the SFEIS sections 3.6 and 3.7.. The Soil Resources Report (Appendix A section A.4-e Land Types and Hazard Ratings) discusses the assessment of landtypes and hazard ratings, soils and productivity, and site conditions where treatments are proposed. Within the entire project area, mass failure potential is rated as follows: 87 percent of the soils has a low potential, 9 percent have moderate potential, and only 4 percent have a high potential. For the actual activity areas, approximately 38 acres (1 percent) is rated as potentially high potential, while 75-80 percent is rated as low and 19 to 24 percent as moderate. See Appendix A tables A-3, A-4, and A-5 for more information. The report also discusses the potential effects vegetation treatments, temporary roads and landings would have on the soil resources as well as the effects of mitigation measures.

F.5-e Comment:
Please disclose what inventory or monitoring information of soil functioning indicators the Forest has, including lichens, fungi, insects, etc. since these can and do define existing and probable future forest conditions, especially related to natural recovery following fire. Lichens in particular, while capturing atmospheric nitrogen for later release to higher plants and trees, are sensitive indicators of atmospheric and ground conditions and cannot be ignored in attempts at ecosystem management. Fungi and insects indicate and largely drive forest condition. Those that act as antagonists or parasites to destructive forms like root disease fungi or bark beetles should be recognized, as should tree pathogens and pests.

Response: The IPNF Forest Plan Monitoring item K-1 address Prescriptions and Effects on Land Productivity. The Forest Soil Resource objective is described as follows: "… to maintain and restore long-term productivity, to support healthy vegetative communities and protect watersheds. Key elements of maintaining long-term soil productivity include retaining surface organic layers, surface volcanic ash, and the bulk density of the surface volcanic ash within natural ranges of variability." Monitoring items include the following:

- Compaction
- Removal of topsoil (displacement)
- Organic matter and coarse woody debris left on site
- Effects of burning

(IPNF 2000 Monitoring Report, pgs 51-52)

F.5-f Comment:
The meaning of "soil productivity" in the terminology of NFMA is largely ignored. In [Forest Service Manual] FSM 2500-99-1 the FS claims that "Soil quality is maintained when erosion, compaction, displacement, rutting, burning, and loss of organic matter are maintained within defined soil quality standards." But even if the FS were to meet the 15% Standard in all Activity Areas forest wide, and even if the soil conditions of land outside proposed activity areas could reasonably be ignored, the FS still cannot assume that there has been no "significant or permanent impairment of the productivity of the land" as NFMA requires.

It is reasonable to expect that in order for the FS to assure that soil productivity is not or has not been significantly impaired, to assure that the forest is producing a sustained yield of timber, for one example, tree growth must not be significantly reduced by soil-disturbing management activities. Grier et al. (1989), in a Forest Service General Technical Report, adopted as a measure of soil productivity: "the total amount of plant material produced by a forest per unit area per year." (P. 1.) And they cite a study finding "a 43-percent reduction in seedling height growth in the Pacific Northwest on primary skid trails relative to uncompacted areas" for example. And in another Forest Service report, Adams and Froehlich (1981) state:

> *Measurements of reduced tree and seedling growth on compacted soils show that significant impacts can and do occur. Seedling height growth has been most often studied, with reported growth reductions on compacted soils from throughout the U.S. ranging from about 5 to 50 per cent.*

Adams and Froehlich (1981) also provide reasons why impacts beyond the directly compacted 15% of an area must be considered in any reasonable definition of soil productivity:

> *Since tree roots extend not only in depth but also in area, the potential for growth impact also becomes greater as compaction affects more of the rooting area. In a thinned stand, for example, you can expect the greatest growth impacts in residual trees that closely border major skid trails or that have been subject to traffic on more than one side of the stem."*

In other words, when an Activity Area reaches 15% detrimentally impacted soils via compaction, tree growth outside the skid trail, or beyond the 15% compacted area, is affected. This is ignored in the Regional Policy and the SDEIS.

The Northern Region recognizes that the Standards must be validated. FSM 2500-99-1 requires that Forest Supervisors must:

- *Assess … whether (soil quality standards) are effective in maintaining or improving soil quality;*
- *Evaluate the effectiveness of soil quality standards and recommend adjustments to the Regional Forester; and*
- *Consult with soil scientists to evaluate the need to adjust management practices or apply rehabilitation measures.*

This all implies that monitoring must be undertaken. Furthermore, FSM 2500-99-1 recognizes that soil productivity is defined not merely in terms of the absence of meeting the 15% standard. "Soil Function" is defined thus:

> *Primary soil functions are: (1) the sustenance of biological activity, diversity, and productivity, (2) soil hydrologic function, (3) filtering, buffering, immobilizing, and detoxifying organic and inorganic materials, and (4) storing and cycling nutrients and other materials.*

And "Soil Quality" is defined as "The capacity of a specific soil to function within its surroundings, support plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation."

Neither soil function nor soil quality, as FSM 2500-99-1 defines it, have ever been monitored on the IPNF following management activities. Unfortunately, the FS seems to have only interpreted monitoring requirements in terms of maintaining no more than 15% of activity areas in a detrimentally disturbed condition.

Page-Dumroese et al. 2000 emphasize the importance of validating soil quality standards using the results of monitoring: Research information from short- or long-term research studies supporting the applicability of disturbance criteria is often lacking, or is available from a limited number of sites which have relative narrow climatic and soil ranges. …Application of selected USDA Forest Service standards indicate that blanket threshold variables applied over disparate soils do not adequately account for nutrient distribution within the profile or forest floor depth. These types of guidelines should be continually refined to reflect pre-disturbance conditions and site-specific information. (Abstract.)

The FS's methodology might approach adequacy if the FS were to have actually validated it by performing objective, scientifically adequate measures of compaction such as measures of bulk density. Adams and Froehlich (1981) state: "While general field observations can be useful in recognizing severe compaction problems, measurement of actual changes in soil density permits the detection of less obvious levels of compaction." It is these "less obvious levels of compaction" that are missed by the kind of monitoring the FS has performed on the IPNF.

For a study done on the Kootenai NF and the adjacent Flathead NF in Montana, soil scientists measured soil bulk densities, macropore porosities, and infiltration rates using paired observations of disturbed vs. undisturbed soils. They discovered that although "the most significant increase in compaction occurred at a depth of 4 inches… some sites showed that maximum compaction occurred at a depth of 8 inches… (and) "Furthermore, ... subsurface compaction occurred in glacial deposits to a depth of at least 16 inches." (Kuennen, Edson, and Tolle, 1979.) There is simply no way that the FS has enough soil bulk density and other compaction monitoring data collected at the adequate soil depths and in enough sites to be able to assure that the use of heavy machinery, as prescribed by the Mission Brush project, will not significantly or permanently impair the productivity of the soil.

In interpreting the requirements of NEPA, the federal courts have evaluated the adequacy of mitigation measures that EISs and EAs rely upon. Relying upon inadequate mitigation measures to protect soils fails to meet this judicially specified test of compliance with NEPA regulations.

Following a study by Cullen and others (1991) which was carried out on the Kootenai NF and the adjacent Flathead NF, the authors concluded: "This result lends support to the general observation that most compaction occurs during the first and second passage of equipment." And Page-Dumroese (1993), in a FS research report investigating logging impacts on volcanic ash-influenced soil in the adjacent IPNF, states, "Moderate compaction was achieved by driving a Grappler log carrier over the plots twice." She also cited other studies that indicated: "Large increases in bulk density have been reported to a depth of about 5 cm with the first vehicle pass over the soil." Williamson and Neilsen (2000) assessed change in soil bulk density with number of passes and found 62% of the compaction to the surface 10cm to come with the first pass of a logging machine. In fine textured soils Brais and Camire (1997) demonstrated that the first pass creates 80 percent of the total disturbance to the site.

Adams and Froehlich (1981) state, "Unfortunately, little research has yet been done to compare the compaction and related impacts caused by low-pressure and by conventional logging vehicles."

Response: We share your concern that compacted soils can retard tree growth. That is why mitigation such as designated trail systems, logging over frozen ground, slash mats or snow is commonly used on the IPNF. The soil analysis is in compliance with NEPA, NFMA, and the Regional Soils Standards as discussed in the Soil Resources Report (Appendix A, section A.4 *Consistency with the Forest Plan and Other Regulatory Direction).*

All proposed cutting units were field-surveyed using techniques outlined in the Northern Regional Soil Quality Standards. All units except Unit 16 currently meet the soil standards (Appendix A, Table A-7). Under Alternative 2, Unit 16 would be rehabilitated in order to move it toward meeting the R-1 standards (Net Improvement of Soils in SFEIS , Chapter 2, section 2.8, and Appendix A section 2.4). The EIS discusses irreversible and irretrievable commitment of resources, and unavoidable adverse effects, including impact to soil productivity, as required by NEPA (SFEIS section 4.8). Features designed to protect soils are listed in the SFEIS Chapter 2 Section 2.8. Monitoring reports are discussed in the above responses and can also be viewed at the following website http://www.fs.fed.us/ipnf/eco/manage/forestplan/index.html - fpmon

F.5-g Comment:
From Grier and others (1989):

> *The potential productivity of a site can be raised or lowered by management activities causing a permanent or long-term increase or decrease in the availability of nutrients essential for plant growth. (P. 27.)*
> *…Any time organic matter is removed from a site, a net loss of nutrients from that site also occurs. In timber harvesting or thinning, nutrient losses tend to be proportional to the volume removed. (P. 27.)*
> *…Slash burning is a common site preparation method that can affect soil chemical properties tremendously. A great deal of controversy is often associated with using fire because of the wide variety of effects, some of which are definitely detrimental to site quality and some of which are beneficial. (P. 30.)*

The SDEIS also fails to cite monitoring results showing the FS has been able to correctly implement the coarse woody debris guidelines on the IPNF. The FS must evaluate the adequacy of such required mitigation measures. An environmental impact statement must present a "reasonably complete discussion of possible mitigation measures." Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 351 (1989).

Response: Nutrient cycling concerns and mitigation are discussed in the SFEIS section 2.8, and the Soil Resources Report in Appendix A (section A.4-d Loss of Nutrients), monitoring reports can be viewed on the IPNFs' website at http://www.fs.fed.us/ipnf/eco/manage/forestplan/index.html - fpmon

F.5-h Comment:
The IPNF has never attempted to put in place a scientifically sound definition of "soil productivity" that can be measured and compared to baseline conditions. Harvey et al., 1994 state:
The ...descriptions of microbial structures and processes suggest that they are likely to provide highly critical conduits for the input and movement of materials within soil and between the soil and the plant. Nitrogen and carbon have been mentioned and are probably the most important. Although the movement and cycling of many others are mediated by microbes, sulfur phosphorus, and iron compounds are important examples.

The relation between forest soil microbes and N is striking. Virtually all N in eastside forest ecosystems is biologically fixed by microbes... Most forests, particularly in the inland West, are likely to be limited at some time during their development by supplies of plant-available N. Thus, to manage forest growth, we must manage the microbes that add most of the N and that make N available for subsequent plant uptake.
(Internal citations omitted.)

Response: IPNF Forest Plan Monitoring Item K-1 lists the following key elements of long-term soil productivity:
- retention of surface organic layers,
- surface volcanic ash and the bulk density of surface volcanic
- ash within natural ranges of variability.

It is outside the scope of this project to redefine the Forest or Regional definition of soil productivity.

F.6 Insect/Disease

F.6-a Comment:
The rationale and analysis of this proposal must look at the forest as an ecosystem with interrelationships coequal to timber production. Please use the ecosystem management approach to assess fungal and insect organisms as capable of operating in a self-regulatory manner and exist as beneficial organisms within the project area. Some species of trees, native insects, and disease organisms are often described by the FS as "invasive" or somehow bad for the ecosystem. Such contentions that conditions are somehow "unnatural" runs counter to more enlightened thinking on such matters. For example, Harvey et al., 1994 state:

> *Although usually viewed as pests at the tree and stand scale, insects and disease organisms perform functions on a broader scale.*
> *…Pests are a part of even the healthiest eastside ecosystems. Pest roles—such as the removal of poorly adapted individuals, accelerated decomposition, and reduced stand density—may be critical to rapid ecosystem adjustment*

…In some areas of the eastside and Blue Mountain forests, at least, the ecosystem has been altered, setting the stage for high pest activity (Gast and others, 1991). This increased activity does not mean that the ecosystem is broken or dying; rather, it is demonstrating functionality, as programmed during its developmental (evolutionary) history.

The FS often makes a case for logging as a way to reduce insect and disease damage to timber stands. As far as we are aware, the FS has no empirical evidence to indicate its "treatments" for "forest health" decrease, rather than increase, the incidence of insects and diseases in the forest. Since the FS doesn't cite research that proves otherwise in the SDEIS, we can only

conclude that "forest health" discussions are unscientific and biased toward logging as a "solution." Please consider the large body of research that indicates logging, roads, and other human caused disturbance promote the spread of tree diseases and insect infestation.

Response:
Refer to the SFEIS section 3.4D for a description of the vegetation resource in the project area that are analyzed from a broad landscape scale down to a project-specific scale. In summary, effective fire suppression has allowed many stands to become multi-layered and overstocked, conditions that are conducive to widespread insect and disease infestations. Also, refer to section 4.3-E in the SFEIS, where the effects of insects and disease agents inhabiting the Mission Brush project area are discussed.

F.6-b Comment:
For example, multiple studies have shown that annosus root disease (Heterobasidion annosum, formerly named Fomes annosus), a fungal root pathogen that is often fatal or damaging for pine, fir, and hemlock in western forests, has increased in western forests as a result of logging (Smith 1989). And researchers have noted that the incidence of annosus root disease in true fir and ponderosa pine stands increased with the number of logging entries (Goheen and Goheen 1989). Large stumps served as infection foci for the stands, although significant mortality was not obvious until 10 to 15 years after logging (Id.).

The proportion of western hemlock trees infected by annosus root disease increased after precommercial thinning, due to infection of stumps and logging equipment wounds (Edmonds et al. 1989, Chavez, et al. 1980).

Armillaria, a primary, aggressive root pathogen of pines, true firs, and Douglas-fir in western interior forests, spreads into healthy stands from the stumps and roots of cut trees (Wargo and Shaw 1985). The fungus colonizes stumps and roots of cut trees, then spreads to adjacent healthy trees. Roots of large trees in particular can support the fungus for many years because they are moist and large enough for the fungus to survive, and disease centers can expand to several hectares in size, with greater than 25% of the trees affected in a stand (id.). Roth et al. (1980) also noted that Armillaria was present in stumps of old-growth ponderosa pine logged up to 35 years earlier, with the oldest stumps having the highest rate of infection.

Filip (1979) observed that mortality of saplings was significantly correlated to the number of Douglas-fir stumps infected with Armillaria mellea and laminated root rot (Phellinus weirii). McDonald, et al. (1987) concluded the pathogenic fungus Armillaria had a threefold higher occurrence on disturbed plots compared to pristine plots at high productivity sites in the Northern Rockies. Those authors also reviewed past studies on Armillaria, noting a clear link between management and the severity of Armillaria-caused disease.

Morrison and Mallett (1996) observed that infection and mortality from the root disease Armillaria ostoyae was several times higher in forest stands with logging disturbance than in undisturbed stands, and that adjacent residual trees as well as new regeneration became infected when their roots came into contact with roots from infected stumps.

Precommercial thinning and soil disturbance led to an increased risk of infection and mortality by black-stain root disease (Leptographium wageneri) in Douglas-fir, with the majority of infection centers being close to roads and skid trails (Hansen et al. 1988). Also another Black-stain root disease (Verticicladiella wagenerii) occurred at a greater frequency in Douglas-fir trees close to roads than in trees located 25 m or more from roads (Hansen 1978). Witcosky et al. (1986) also noted that precommercially thinned stands attracted a greater number of black-stain root disease insect vectors.

Complex interactions involve mechanical damage from logging, infestation by root diseases, and attacks by insects. Aho et al. (1987) saw that mechanical wounding of grand fir and white fir by logging equipment activated dormant decay fungi, including the Indian paint fungus (Echinodontium tinctorium).

Trees stressed by logging, and therefore more susceptible to root diseases are, in turn, more susceptible to attack by insects. Goheen and Hansen (1993) reviewed the association between pathogenic fungi and bark beetles in coniferous forests, noting that root disease fungi predispose some conifer species to bark beetle attack and/or help maintain endemic populations of bark beetles.

Goheen and Hansen (1993) observed that live trees infected with Laminated root rot (Phellinus weirii) have a greater likelihood of attack by Douglas-fir beetles (Dendroctonus pseudotsugae). Also, Douglas-fir trees weakened by Black-stain root disease (Leptographium wageneri var. pseudotsugae) are attacked and killed by a variety of bark beetle species, including the Douglas-fir bark beetle (D. pseudotsugae) and the Douglas-fir engraver (Scolytus unispinosis) (id.).

The root disease Leptographium wageneri var. ponderosum predisposes ponderosa pine to several bark beetle species, including the mountain pine beetle (D. ponderosae) and the western pine beetle (D. brevicomis) (Goheen and Hansen 1993).

A variety of root diseases, including black-stain, Armillaria, and brown cubical butt rot (Phaeolus schweinitzii), predispose lodgepole pine to attack by mountain pine beetles in the interior west. The diseases are also believed to provide stressed host trees that help maintain endemic populations of mountain pine beetle or trigger population increases at the start of an outbreak (Goheen and Hansen 1993).

Grand and white fir trees in interior mixed-conifer forests have been found to have a high likelihood of attack by the fir engraver (Scolytus ventralis) when they are infected by root diseases, such as laminated root rot, Armillaria, and annosus (Goheen and Hansen 1993).

More western pine beetles (Dendroctonus breviformis) and mountain pine beetles (D. ponderosae) were captured on trees infected by black-stain root disease (Ceratocystis wageneri) than on uninfected trees (Goheen et al. 1985). The two species of beetle were more frequently attracted to wounds on trees that were also diseased than to uninfected trees. They also noted that the red turpentine beetle (Dendroctonus valens) attacked trees at wounds, with attack rates seven-to-eight times higher on trees infected with black-stain root disease than uninfected trees. Spondylis upiformis attacked only wounded trees, not unwounded trees (Id.).

Response:
When considering annosus root disease, it is important to distinguish among the three species now known to constitute the former Heterobasidion annosum (Niemela and Korhonen 1998). These species have differing abilities to cause disease in western conifers.

- H. annosum is a pathogen of Pinus spp. and has not been documented to occur in northern Idaho.
- H. abietinum is a pathogen of Abies spp. and, in northern Idaho, Douglas-fir.
- H. parviporum is a pathogen of Picea abies and may not occur in North America.

This may account for reports such as Kliejunas (1986) in which annosus-infected fir stumps were found not to result in infection of planted pines.

There is reasonably good evidence that H. annosum will not only establish long-term infections in large pine stumps (at least 17”), but will cause significant subsequent mortality in residual and regenerated pines. However, this pathogen is not known in north Idaho and we have looked for it consistently for at least 20 years. The nearest known H. annosum is in western Montana, on the Flathead Indian Reservation near Hot Springs. It occurs on very dry habitat types, mostly ponderosa pine Habitat Types, and possibly the very driest Douglas-fir (pinegrass). This may account for the apparent absence of this pathogen on the IPNF, Clearwater NF and Nez Perce NF.

Most studies using permanent plots, rather than retrospective surveys, have shown that harvests that leave (or result in regeneration of) susceptible hosts neither increase nor decrease survival of residuals. Others have been inconclusive, showing increased mortality in about half of the locations while growth also increased. Although infected stumps do act as inoculum sources for subsequent stands on a site, so do root systems of trees killed by root disease. This is likely the reason there is no clear response to stump creation. However, in nearly all published reports, there was clearly no benefit to the residuals except where species composition was shifted toward root disease resistant or tolerant species. In other words, cutting trees, whether partial or clearcut harvests, may not hurt but it almost certainly won’t help the disease situation without species conversion.

The retrospective study reported in Goheen and Goheen (1989) concludes that stands with multiple logging entries had more evidence of annosus root disease in grand fir than stands with a single entry. This conclusion is generally accepted but it should be noted that, as a retrospective study, it is possible, even probable that repeated harvest entries were in response to higher initial mortality rates due to root disease. Therefore, it is not possible to determine whether the harvests were the cause, or the result, of elevated levels of root disease.

Also, in a more recent publication, Filip and others (1992) reported high levels (89%) of true fir stump infection in shelterwood and seedtree harvest units but considered this due to pre-existing root infections. (Present before harvest.) They also reported that up to 9 years after harvest, only 0.2% of regenerated trees had died of annosus root disease, despite the high inoculum levels in stumps. At 15-19 years, the mortality rates from annosus root disease were even lower (>0.001%). Lockman (1993) found that tree infection rates in several sites on the Nez Perce NF in northern Idaho were low in both clearcut and paired uncut units. Although stump infection rates were higher in clearcut units, the rate of associated tree infection was not different between cut and uncut units. Based on our current knowledge of annosus root disease in Douglas-fir and true fir stands, infection of cut stump surfaces by spores probably has little or no influence upon disease development in residual trees or

regeneration. However, infected stumps are very likely to play a role in perpetuation of the fungus and development of disease as trees reach maturity.

These references to the very unique Armillaria infection centers in ponderosa pine in the (much studied) Glenwood area of Washington are not appropriate in assessing the behavior of Armillaria ostoyae in north Idaho. However, that Armillaria spp will utilize stumps for long-term food sources and spread from stumps to live trees is accepted as fact.

Armillaria ostoyae, Heterobasidion abietinum and Phellinus weirii (now, more appropriately Inonotus heinrichii) are all considered to be capable of maintaining significant biomass for long periods in large stumps. Armillaria ostoyae is known to be capable of developing very large, presumably very old, clones that survive from one generation to the next on a site (Dettman and van der Kamp 2001a and b). Whether a stand is uncut, clearcut, partially cut or burned these fungi will survive in root systems of dead trees and eventually spread to whatever live hosts are available.

The relative "vigor" of Douglas-fir does not affect the likelihood of mortality caused by A. ostoyae (Rosso and Hansen 1998). In the case of I. heinrichii, the more vigorous Douglas-fir may be more likely to be killed because their larger root systems contact more inoculum, sooner (Bloomberg and Reynolds 1985). However, some conifer species are significantly resistant to both Armillaria ostoyae and the non-cedar form P. weirii (I. heinrichii). Western larch (Robinson and Morrison 2001), ponderosa pine, western white pine, western redcedar and lodgepole pine are all resistant to A. ostoyae after the age of about 20-30 years (Filip and Schmitt 1990, Hagle and others 2003, Morrison 1981). These species are also tolerant or resistant to the non-cedar form of P. weirii (Filip and Schmitt 1990, Hadfield 1995, Hagle and others 2003, Nelson and Sturrock 1993). They are also resistant to fir-type annosus root disease (Hagle and others 2003).

In their 1987 report, McDonald, G.I., Martin, N. E. and A. E. Harvey state:

> The incidence of pathogenicity was high (59 percent) on disturbed plots in the ABGR, THPL and TSHE series and incidence of pathogenicity was low (18 percent) on undisturbed plots in the ABGR, THPL and TSHE series; incidence of pathogenicity was high (65 percent) on undisturbed plots in the PSME and ABLA series and the incidence of pathogenicity was low (25 percent) on disturbed plots in the PSMA and ABLA series. (McDonald, et.al., 1987. Armillaria in the northern rockies: Pathogenicity and host susceptibility on pristine and disturbed sites. USDA Forest Service Intermountain Research Station. Res. Note INT-371. 5 p.)

The upshot is the authors have concluded that disturbance can either increase or decrease "pathogenicity" of Armillaria, depending on the habitat type.

> In reality, the combination of relatively few plots and failure to account for differences in tree species (potential host) composition makes these results hard to credit. The primary author has stated regarding this study "Since a limited number of plots were included in this study, these results must be considered as preliminary." (G.I. McDonald; Relationships among site quality, stand structure, and Armillaria root rot in Douglas-fir forests.) Since Byler and others (1990) and Morrison and others 2000, and Cruikshank and others 2001 found dry sites to have the least incidence of mortality from Armillaria root disease, it is likely Dr. McDonald is correct in considering his 1987 results preliminary.

Blackstain root disease is rare in North Idaho and does not play a significant role in forests in North Idaho so these reports have no bearing on this discussion.

Complex interactions involve mechanical damage from logging, infestation by root diseases, and attacks by insects. Aho et al. (1987) saw that mechanical wounding of grand fir and white fir by logging equipment activated dormant decay fungi, including the Indian paint fungus (Echinodontium tinctorium).

Trees stressed by logging, and therefore more susceptible to root diseases are, in turn, more susceptible to attack by insects. Goheen and Hansen (1993) reviewed the association between pathogenic fungi and bark beetles in coniferous forests, noting that root disease fungi predispose some conifer species to bark beetle attack and/or help maintain endemic populations of bark beetles.

Goheen and Hansen (1993) observed that live trees infected with Laminated root rot (Phellinus weirii) have a greater likelihood of attack by Douglas-fir beetles (Dendroctonus pseudotsugae). Also, Douglas-fir trees weakened by Black-stain root disease (Leptographium wageneri var. pseudotsugae) are attacked and killed by a variety of bark beetle species, including the Douglas-fir bark beetle (D. pseudotsugae) and the Douglas-fir engraver (Scolytus unispinosis) (id.).

The root disease Leptographium wageneri var. ponderosum predisposes ponderosa pine to several bark beetle species, including the mountain pine beetle (D. ponderosae) and the western pine beetle (D. brevicomis) (Goheen and Hansen 1993).

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Grand and white fir trees in interior mixed-conifer forests have been found to have a high likelihood of attack by the fir engraver (Scolytus ventralis) when they are infected by root diseases, such as laminated root rot, Armillaria, and annosus (Goheen and Hansen 1993).

More western pine beetles (Dendroctonus breviformis) and mountain pine beetles (D. ponderosae) were captured on trees infected by black-stain root disease (Ceratocystis wageneri) than on uninfected trees (Goheen et al. 1985). The two species of beetle were more frequently attracted to wounds on trees that were also diseased than to uninfected trees. They also noted that the red turpentine beetle (Dendroctonus valens) attacked trees at wounds, with attack rates seven-to-eight times higher on trees infected with black-stain root disease than uninfected trees. Spondylis upiformis attacked only wounded trees, not unwounded trees (Id.).

F.7 Roads

F.7-a Comment:
The Roads Analysis Process should not lead to arbitrary decisions but should be reviewable by the public. What little we know of the process is that it results in unknown impacts on affected resources due to ever-increasing ATV traffic and unknown continued damage due to roads that will not receive necessary maintenance due to funding shortfalls.

The SDEIS also fails to adequately disclose the cumulative impacts of the ever-increasing motorized recreational use on wildlife species. The Analysis of the Management Situation for Revision of the Kootenai and Idaho Panhandle Forest Plans (AMS) notes: "Roads that were originally constructed and used for timber harvest are now predominately used for recreation purposes…" (p. 41). The fact that the FS has never publicly declared that the existence of these single-use timber roads was not to create expectations of unlimited use of such roads for recreation access has led to unrealistic expectation on the part of certain members of the public, and also unwarranted political pressure to maintain maximum access.

Response: The Draft EIS was released on August 22, 2003 for public review, and the comments from that review were integrated into the Roads Analysis Process for the FEIS (project file document TRANS-01).

Background of the Roads Analysis Process

On January 12, 2001, 36 CFR Part 212 became effective with publication in the Federal Register. This Rule amended the Administrative Policy on Forest Transportation Systems under FSM 7700 by establishing "…requirements for the administration of the forest transportation system, including roads, trails, airfields, and provisions for acquisition of rights-of-way. Describes a minimum road system and requires a science-based roads analysis to plan the road system and to set funding priorities…" (FSM 7701.3-4).

To paraphrase section 7702 of the Policy, the objective of the Road Management Policy is to *provide a road system that is safe, responsive to the public and agency needs, environmentally sound, affordable and efficient to manage*.
Road Management includes making decisions on opportunities to:

1) Maintain and reconstruct needed roads,;
2) Decommission unneeded roads; and,
3) Add new roads.

The Policy requires that these decisions "must be informed by a roads analysis process (FSM 7712.1) conducted at an appropriate scale".

The ID Team conducted a roads analysis, which considered all the roads in the project area and the needs for each. The analysis determined which routes are needed for the long-term, which are only needed in the short-term, and which are not needed at all. The analysis also prioritized road improvements, decommissioning, and storage needs. Many of the roads were considered surplus to the needs of the Forest and public, and will be decommissioned. Many of the roads in the project area continue to be needed for access to private in holdings and for administrative uses. In response to the increased and unregulated ATV pressure in the Brush Lake area, a designated ATV trail system is proposed with this project. (SFEIS section 2.7 and Figure 2.4.

F.8 Wildlife

The following comments on wildlife analyses have been summarized to focus on the substantive portions of the comments. The full text is located in the project file and is available upon request.

F.8-a Comment:
Population viability and Old Growth.

"Wildlife species will occupy their preferred niche on the landscape and move from place to place as forest structures change and different habitat conditions develop." (SDEIS at p. 31.)

The FS doesn't have data on how most TES and MIS wildlife select habitat, following past management actions, so cumulative effects are not understood, simply following from your neglect of monitoring responsibilities outlined in the Forest Plan and NFMA regulations.

For the proposal to be consistent with the Forest Plan, enough habitat for viable populations of old-growth dependent wildlife species is needed over the landscape. The cumulative effects of carrying out multiple projects simultaneously across the IPNF makes it imperative that population viability be assessed at least at the forestwide scale (Marcot and Murphy, 1992).

Also, temporal considerations of the impacts on wildlife population viability from implementing something with such long duration as a Forest Plan must be considered (id.) but this has never been done by the IPNF.

The connection between the areas designated for old growth management and old growth species, i.e. how these acres contribute to old growth species' viability, is glossed over. As far as we're aware, the IPNF has never determined minimum viable populations for any MIS or TES species as NFMA requires, nor has it specified the amount and distribution of habitat necessary to maintain viable populations. Nor has it monitored population trends of indicator species, as NFMA requires.

The FS has acknowledged that viability is not merely a project area consideration, that the scale of analysis must be broader.

State-of-the-art conservation biology and the principles that underlie the agency's policy of "ecosystem management" dictate an increasing focus on the landscape-scale concept and design of large biological reserves accompanied by buffer zones and habitat connectors as the most effective (and perhaps only) way to preserve wildlife diversity and viability (Noss, 1993).

The FS has stated: "Well distributed habitat is the amount and location of required habitat which assure that individuals from demes,[1] distributed throughout the population's existing range, can interact. Habitat should be located so that genetic exchange among all demes is possible." (Mealey 1983.)

The FS should firmly establish that the species that exist, or historically are believed to have been present in the analysis area are still part of viable populations.

Analysis must identify viable populations of MIS, TES, at-risk, focal, and demand species of which the individuals in the analysis area are members in order to sustain viable populations. Post-project surveys for old-growth MIS and Sensitive species in forest areas treated similarly as this proposal are necessary to determine habitat suitability and occupancy. If surveys have been completed, what are the results?

Since the Mission Brush SDEIS provides inadequate analysis regarding the size and quality of habitat blocks needed by the pileated woodpecker, the analysis completely fails to disclose the quantitative or qualitative significance of cumulative effects due to past logging in the area.

The flammulated, boreal owl and the great gray owl are species of concern that are sensitive to logging and other management activities. The IPNF provides inadequate management strategies to insure their viability.

The FS should disclose the sensitive species for which population trends are unknown. The FS has failed to tier the viability analyses for Sensitive species that would be impacted by the Mission Brush project to a landscape analysis of Sensitive species viability that would allow for some assurances to the public that species viability is currently being insured in spite of continued habitat destruction and/or alteration.

[1] Subpopulations.

From the KIPZ AMS [Kootenai NF – IPNF Assessment of the Management Situation] *Technical Report:*

> *Sensitive species are those species for which population viability is a concern, and are administratively determined by the Regional Forester. Population trends for many of these species is unknown at this time. Monitoring for sensitive bird species is being conducted as part of the Region 1 Landbird Monitoring Program. This program monitors bird presence along permanent transects in both managed and unmanaged, burned and unburned forests in all forest types. Once adequate data is available assumptions on population trends may be determined for some of these species. (p. 52, emphasis added.)*

First of all, the FS should disclose which species for which population trends are unknown. It is particularly telling that, following over 17 years of original Forest Plan implementation, the FS has no idea as to the population trends of these species. This means the FS has not "insured viability" as NFMA requires. Unexplained is why the FS did not take the steps necessary to insure viability, like follow NFMA and Forest Plan monitoring requirements by performing population surveys, or like follow its own Forest Service Handbook and Forest Service Manual guidance and design ***conservation strategies*** *for Sensitive species:*

> *The companion approach to the coarse filter is the "fine filter" analysis in which conservation strategies are used for individual species or groups of species to contribute to population viability. The fine filter approach narrows the focus to those species that require habitat that may be outside the historic range of variation (HRV). (AMS Technical Report p. 49, emphasis added.)*

Enumeration of and monitoring of specific small, non-game birds and animal populations that are important in keeping destructive insect populations at low levels must also be disclosed.

Response: It is unreasonable to "include a cumulative effects analysis area that would include truly viable populations" in project level analyses, since for some species this would include a "cumulative effects analysis area" several orders of magnitude larger than the project area itself. For example: a cumulative effects area sufficient to include a viable population of grizzly bears would be at least the size of an individual Recovery Zone. Analyzing at this scale would effectively dilute the impacts of project-level activities – defeating the purpose of cumulative effects analysis.

The IPNF has developed Forest-wide wildlife habitat capability/suitability models, for five Threatened, Sensitive, and MIS wildlife species or species guilds (Canada lynx, flammulated owl/pygmy nuthatch/fringed myotis, fisher/marten, Northern goshawk, and white-tailed deer). In order to validate these models, Forest Service personnel conducted site visits of representative capable habitat for these species, with emphasis placed on stands modeled as "currently suitable." Some proposed treatment areas potentially include suitable habitat for one or more species addressed in the model.

The District has not specifically undertaken post-project surveys for old-growth MIS and Sensitive species in forest areas treated similarly. However, several northern goshawk nesting territories have been documented in areas that have sustained commercial timber harvest in the past (Placer-Moyie 2, Shorty, Solomon, Boulder City, Perkins, Bonner Swamp and Rock Creek).

From the Mission Brush SFEIS section 4.6-A, all action alternatives are consistent with Forest Plan direction to manage the habitat of species listed in the Regional Sensitive Species List to prevent further declines in populations, which could lead to federal listing under the Endangered Species Act (USDA 1987, p. II-28). Therefore, these actions would also be consistent with the National Forest Management Act requirements for population viability (CFR 219.19). The Forest Plan Old Growth requirements are listed on II – 29 of the Forest Plan and in section 4.4-B of the SFEIS. These measures provide a proxy on proxy approach and not a species-specific population survey for old growth dependant species.

Old growth habitat is dynamic, as mature timber stands cycle into old growth status, some old growth stands cycle out of old growth status (see Alternative 1 discussions in sections 4.3-A and 4.3-B of the SFEIS).

Annual IPNF monitoring reports track old growth habitat on the forest. Details are available at the forest website at: http://www.fs.fed.us/ipnf/eco/manage/forestplan/index.html - fpmon. The Mission Brush project does not propose cutting any old growth stands. Forest Plan revision cycles are outside the scope of this document.

F.8-b Comment:

According to official FS policy, the FS "must develop conservation strategies for those sensitive species whose continued existence may be negatively affected by the forest plan or a proposed project." FSM 2670.45. The FS never has. According to FS experts, population viability analysis is not plausible or logical, from a scientific standpoint, at the project level such as the scale of a timber sale(s), absent some tiering to a larger-scaled study. Distributions of common wildlife species as well as species at risk encompass much larger areas than typical project areas (often referred to as "landscape scales"). The FS has

failed to tier the viability analyses for Sensitive species that would be impacted by the Mission Brush project to a landscape analysis of Sensitive species viability that would allow for some assurances to the public that species viability is currently being insured in spite of continued habitat destruction and/or alteration.

Response: FSM 2670.45 says no such thing, but that the Forest Supervisor must "develop quantifiable objectives for managing populations and/or habitat for sensitive species." The Forest Service Manual (FSM) at 2621.2 states, "units must develop conservation strategies for those sensitive species whose continued existence may be negatively affected by the forest plan or a proposed project." The Forest Plan established the objective that "sensitive species will be managed to assure adequate populations to prevent the need for Federal listing." Analysis found the Mission Brush project "may impact individuals or habitat, but will not likely result in a trend in federal listing or reduced viability for the population or species." Conservation strategies are, therefore, not required for any sensitive species.

F.8-c Comment:
Please disclose the results of detailed field surveys undertaken in the Mission Brush project area for the pygmy nuthatch, white-headed woodpecker, and flammulated owl. What other documentation, non-FS, exists that reveals their presence (at any time) in the project area? Also, please disclose if these species' nests have been found anywhere on the Bonners Ferry Ranger District.

Response: Field notes for species relevant to the Mission Brush project are in the project file. Other bird sightings are at the district office and available upon request. There have been no field surveys in the project area for pygmy nuthatch or white-headed woodpecker. Presence surveys were conducted for flammulated owls west of Brush Lake in 1993, 1999 and 2000, and south of Hall Mountain (along roads 2217A & 2217C) from 1997-2000, and again in 2003. The west face of Hall Mountain, which potentially has the best current flammulated owl habitat in the project area, was also surveyed in 2003. No flammulated owl vocalizations have been recorded on any of these surveys. (SFEIS section 3.8-D.2) There are no records in the CDC database of any of these species in the project area, nor are there any records of the nests of these species on the Bonners Ferry Ranger District.

F.8-d Comment:
The continued fragmentation of the IPNF is a major ongoing concern. It is documented that edge effects occur 10-30 meters into a forest tract (Wilcove et al., 1986). The size of blocks of interior forest that existed historically before management (including fire suppression) was initiated--compared to the present condition—is not adequately considered. Again, this should be a landscape ecology analysis that looks at the larger picture of the fragmentation of habitat in surrounding concentric circles.

Response: Wildlife habitat fragmentation is discussed using species-specific habitat suitability discussions (i.e. Lynx – SFEIS section 4.6-B-b). Further fragmentation is prevented by restoring forest composition and structure over larger landscapes to a sustainable state, similar to those found at the larger scale (SFEIS section 1.5 Scientific Assessments from the Broad-scale to Site-Specific).

F.8-e Comment:
The FS's analysis of goshawks seems to reflect a very poor understanding of northern goshawk habitat requirements. Logging, road building and other disturbance associated with the project and other cumulative impacts would affect goshawk nesting, post-fledging family habitat, alternative nesting, foraging, competitors, prey and potential habitat, including areas far from cutting units. Fragmentation should have been more thoroughly considered with respect to goshawks. Reynolds, et al. 1992 provide a basis for a northern goshawk conservation strategy that could be implemented if forestwide habitat considerations were to be truly taken into account. Reynolds et al. (1992) suggest that it is essential to viability of goshawks that 20-50% of old growth within their nesting areas be maintained, yet nothing in the SDEIS seems to recognize that (see also Suring et al. 1993). Graham, et al. 1999, USDA Forest Service 2000b, Iverson et al. 1996, and Suring et al. 1993 are more examples of northern goshawk conservation strategies the FS might adopt for this Forest, if emphasis was more appropriately placed on species conservation and insuring viability rather than justification for resource extraction.

Response: The SFEIS, in a large part, reviewed possible impacts of the project relative to guidelines in the Management Recommendations for the Northern Goshawk in the Southwestern United States (SFEIS sections 3.8-D, and 4.6-C-c). Reynolds et al. (1992) never suggest that "20-50% of old growth within their nesting areas be maintained", but recommend 20% of a PFA be in "old forest" (VSS 6). Nest areas themselves are rather small (20-25 acres), and are generally comprised exclusively of mature or old forest.

Goshawk nest site protection measures are designed to maintain the productivity of existing nesting territories. Logging operations and related Forest Service activities would be suspended within ½ mile distance of active nest site during nesting season to promote nesting success and provide foraging opportunities for adults and fledglings during fledgling dependency period (See SFEIS sections 2.8-A.4, and 4.6-D.3). In literature cited section (Reynolds et al. 1992) states the thinning from below or thinning unwanted understory trees is a preferred treatment for maintaining stand structure within nest area. Fragmentation is minimized using larger patch sizes (SFEIS section 1.2-C).

More recent research (Moser and Garton 2004) has found that timber harvest had no effect on breeding area occupancy, nest success, or productivity 1 to 2 years after timber harvest. The researchers concluded that in northern Idaho, timber harvest does not appear to affect goshawk breeding area occupancy, nest success, or productivity two years after harvest as long as suitable nesting habitat remains within the breeding area. As discussed above, goshawks have established a number of nesting territories on the District in stands that have had commercial timber harvest in the past.

F.8-f Comment:
USDA Forest Service, 2000b recommends that forest opening greater than 50-60 acres be avoided in the vicinity of goshawks. At least five years of monitoring is necessary to allow for effective estimates of habitat quality (Id.). Research suggests that a localized distribution of 50% old growth should be maintained to allow for viability of goshawks (Suring et al. 1993).

Response: The proposed action would not result in true openings greater than 50-60 acres, although group selection and shelterwood harvest prescriptions will result in large areas of relatively open tree canopy that would no longer be suitable goshawk nesting habitat. The Suring et al. (1993) recommendations were designed for the Tongass N.F. in southeastern Alaska, and the research used to develop them was specific to the Queen Charlotte subspecies of goshawk (Accipiter gentilis liangi) rather than the northern goshawk (A. g. atricapillus) found locally. The Queen Charlotte subspecies exhibits smaller size, more rounded wings and proportionately longer tails than the atricapillus subspecies – which are probably adaptations to their rainforest environment (Crocker-Bedford 1993). The coastal areas inhabited by this subspecies historically would have had very few natural openings (since fire is a very minor factor in shaping vegetation in these areas), and subsequently A. g. liangi would be expected to make much greater use of dense forest stands. A. g. atricapillus, on the other hand, evolved in generally warmer, drier environments which contained mature forest interspersed with small openings. As a result, the management recommendations of Reynolds et al. (1992) are more appropriate for our area.

F.8-g Comment:
Goshawks are often associated with a thick overstory cover and areas with a large number of large trees. For example, Hayward and Escano (1989) recommend an overstory canopy between 75 and 80%. According to the BE/BA for the Keystone Quartz EIS in the Beaverhead-Deerlodge NF, "Goshawks prefer vegetation structure that permits them to approach prey unseen and to use their flight maneuverability to advantage (Widen, 1989, Beier and Drennan 1997)…"

Response: Please refer to the SFEIS (section 3.8-D.2) for a general discussion of goshawk habitat requirements. For analysis purposes, only harvested stands that would retain an overstory canopy of greater than 70% would be considered suitable goshawk nesting habitat.

F.8-h Comment:
The issue of fragmentation should have been more thoroughly considered with respect to goshawks. Other edge-adapted species may compete with the goshawk and displace the goshawk if adequate amounts of forest interior habitat is not provided. Crocker-Bedford (1990) recommends that a foraging area of >5000 acres of dense forest, in which no logging is permitted, be designated for goshawks, with additional areas of 2500-5000 acres of more marginal habitat designated beyond this 5,000 acre foraging area.

Response: We used the management recommendations of Reynolds et al. (1992), which is a more recent and comprehensive publication examining the conservation of goshawks. In it, the authors suggest maintaining up to 40% of the foraging area as "young forest", "seedling/sapling forest" or "grass/forb/shrub". This somewhat contradicts Crocker-Bedford's recommendation of a "foraging area of greater than 5000 acres of dense forest".

F.8-i Comment:
The SDEIS failed to disclose and analyze the uncertain and precarious population status of the fisher, as described in Witmer, et al., 1998:

> *The status of the fisher in the Western United States is poorly known but generally perceived as precarious and declining. This is a serious issue alone, but it also is a component of the larger problem of the decline of biological diversity. Recovery of species of concern must necessarily focus on the population level, because this is the scale at which genetic variation occurs and because population [sic] are the constituent elements of communities and ecosystems. Systematic*

habitat alteration and overexploitation have reduced the historical distribution of fishers in suitable habitat in the interior Columbia basin to isolated and fragmented populations. Current populations may be extremely vulnerable to local and regional extirpation because of their lack of connectivity and their small numbers (Id. at 14, internal citations omitted).

The extensive logging, snag removal and other activities associated with the project would negatively affect movement, denning, resting areas, genetic diversity, and other aspects of fisher life cycles and fisher survival could be impacted by the project; the FS does not fully consider these elements of the project or adequately mitigate their impacts. The FS has so far neglected to prepare a conservation strategy for this Sensitive species.

Response: Potential impacts to fisher and its habitat are provided in the SFEIS (*section 4.6-D.4*). The analysis concluded that the project would not likely cause a loss of viability to fisher. The rationale for this conclusion was:

1) many acres proposed for treatment have high levels of root rot infestation, and are only expected to provide habitat for a relatively short time;
2) several treatment units are areas of isolated or disconnected habitat, and are not likely to be heavily utilized;
3) substantial percentages of currently suitable denning habitat are protected by LCAS guidelines;
4) INFISH buffers and BMPs assure that riparian habitats important to fishers will be undisturbed; and
5) fisher habitat is generally maturing at a faster rate than it is lost on the IPNF.

F.8-j Comment:

Regarding another IPNF Sensitive species, the FS has yet to design a consistent, workable, scientifically defensible strategy to ensure viable populations of the black-backed woodpeckers. The cumulative impacts of the IPNF's ongoing fire suppression policy are also not adequately considered. We have recently (within the last 0 to 15 years) realized that disease and fire have their place on the landscape, but the landscape is badly out of balance with the fire suppression and insect and disease reduction activities (i.e. salvage logging) of the last 50 years. Therefore, the black-backed woodpecker is likely not to be abundant as it once was, and continued fire suppression and insect eradication is likely to cause further decline.

The Region 1 black-backed woodpecker assessment (Hillis et al., 2003) notes that the black-backed woodpecker depends upon the very forest that this project targets for much of its logging, removal of dead and dying trees:

Black-backed woodpeckers occupy forested habitats that contain high densities of recently dead or dying trees that have been colonized by bark beetles and woodborer beetles (Buprestidae, Cerambycidae, and Scolytidae). These beetles and their larvae are most abundant within burned forests. In unburned forests, bark beetle and woodborer infested trees are found primarily in areas that have undergone natural disturbances, such as wind-throw, and within structurally diverse old-growth forests. (Internal citations omitted.)

…Black-backed woodpeckers also occur in unburned landscapes Bull et al. 1986, Goggans et al.1987, Bate 1995, Hoffman 1997, Weinhagen 1998, Steeger and Dulisse in press, Taylor unpublished data). Taylor's observations of black-backed woodpeckers in unburned forests in northern Idaho suggest that they may occur at substantially lower densities in unburned forests, but no rigorous comparisons between black-backed woodpecker densities in burned and unburned forests have been done. Hutto (1995) hypothesized that black-backed woodpeckers reproduce at source reproductive levels in burns, but may drop to sink reproductive levels in the intervening periods between large burns.

Response: Fire and disease have affected a significant portion of the Northern Rockies in subsequent years. Acres affected by stand-replacing fires have increased throughout the west in the last decade. Similarly, the amount of tree mortality caused by insects and disease has steadily grown on the Bonners Ferry RD. Furthermore, salvage logging takes place on only a very small proportion of the IPNF land base. For example, only approximately 220 acres of the 3,600 acre Myrtle Fire area were salvaged. Tree mortality will continue to occur outside the project area, and small-diameter snags will continue to be created at a faster rate than they are removed. As stated in the SFEIS (section 4.6-D.1), black-backed woodpeckers will maintain populations at low endemic levels during times when immediate post-fire habitat is at reduced availability, and their current distribution would be sustained.

F.8-k Comment:

Lofroth (1997) in a study in British Columbia, found that wolverines use habitats as diverse as tundra and old-growth forest. Wolverines are also known to use mid- to low-elevation Douglas-fir forests in the winter (USDA Forest Service, 1993). Please explain why this scientific information should be discounted for the purposes of the Mission Brush project.

Response: Impacts and management of wolverines are discussed in the SFEIS Appendix B section A.2-e. Since USDA Forest Service (1993) is not included in your list of references, it is unclear what research or document you are referring to. Scientific information was not "discounted" for purposes of this project.

Wolverines may make occasional use of the project area, and the SFEIS acknowledges that a wolverine was observed at the periphery of the project area in 2001. Wolverines require large, remote areas to roam and feed. The proposed actions are located in the developed (roaded) portion of the project area, in an environment that makes wolverine presence untenable or undesirable. While a wolverine was observed in the southern portion of the project area in 2001, this observation was located on the fringe or periphery of a large block of undeveloped ground to the east of the project area. With the exception of the steep west face of Hall Mountain, which is dominated by dry forest types, most of the proposed units are in areas easily accessed by open roads or trails. This proposal would not increase winter recreational use of the area, access would remain unchanged, ungulate populations are at or near all time highs so foraging habitat does not appear to be limiting; and there are no high elevation cirque basins or potential denning habitat (probably the most limited and critical component of wolverine habitat) in the project area.

F.8-l Comment:
The IPNF provides inadequate management strategies to insure viability of the pine marten. The IPNF provides inadequate management strategies to insure viability of the pine marten. Ruggerio, et al. (1998) and Bull and Blumton, 1999, indicate that vertical and horizontal diversity provided by snags and large down woody debris are important habitat characteristics for the pine marten, another old-growth wildlife species. The kind of treatments proposed for the Mission Brush project reduce the availability of prey species for the marten.

Old growth allows martens to avoid predators, provides resting and denning places in coarse woody debris and large diameter trees, and allows for access under the snow surface. USDA Forest Service, 1990 is summary of old-growth habitat needs of martens reviewed research suggesting that martens prefer forest stands with greater than 40% tree canopy closure and rarely venture more than 150 feet from forest cover, particularly in winter. It also cites research suggesting that at least 50% of female marten home range should be maintained in mature or old growth forest. Also, consideration of habitat connectivity is essential to ensuring marten viability: "To ensure that a viable population of marten is maintained across its range, suitable habitat for individual martens should be distributed geographically in a manner that allows interchange of individuals between habitat patches (Ibid.).

The IPNF (USDA Forest Service, 2000c) recently called for updated snag guidelines: "Apply snag and down woody material guidelines from the Upper Columbia River Basin Assessment to improve marten habitat" (p. 39), unfortunately at all levels this recommendation has subsequently been ignored.

Response: Ruggerio et al. (1998) also state that marten are closely associated with late-successional stands of mesic conifers, especially those with complex physical structure near the ground. The majority of acres proposed for treatment in the Mission Brush EIS are moderately warm and dry, and historically would not have contributed substantially to marten habitat. As discussed in the fisher analysis (SFEIS section 4.6-D.4) roughly half of the suitable habitat in proposed units in the Mission Creek area is somewhat isolated, and lacks connectivity to other suitable stands. Nevertheless, the management of coarse woody debris would follow Forest Service Northern Region guidelines, and large diameter snags that are felled for safety reasons would remain on site to provide for large woody debris recruitment. Impacts and management of the marten are discussed in the SFEIS Appendix B section A.2-g.

F.8-m Comment:
The IPNF has otherwise recognized the need for updated guidelines for the pine marten: "Apply snag and down woody material guidelines from the Upper Columbia River Basin Assessment to improve marten habitat" (USDA Forest Service 2000c, p. 39).

Response: Because of similarity of habitat requirements, pine marten are treated as a guild with fisher. Detailed analysis of project effects on fisher are given in the SFEIS (section 4.6-D.4). The analysis concluded that the project would not likely cause a loss of viability to fisher.

F.8-n Comment:

The IPNF continues to ignore the fact that Bull et al., 1997 essentially nullify the IPNF's snag habitat retention and management strategies. The high density of snags and defective trees within old-growth (Green et al. 1992) would likely be substantially eliminated with the planned logging. This document presents new information on the retention and selection of trees and logs most valuable to wildlife.

…Current direction for providing wildlife habitat on public forest lands does not reflect this new information. Since the publication of Thomas and others (1979), new research suggests that to fully meet the needs of wildlife, additional snags and

habitat are required for foraging, denning, nesting, and roosting. Although we do not suggest specific numbers or snags to retain by forest type, tow recent studies indicate that viable woodpecker populations occurred in areas with about four snags per acre.

The SDEIS does not adequately consider that snags may be cut down for safety reasons during logging operations (due to OSHA regulations). The SDEIS fails to disclose how much snag loss would be expected because of safety concerns and also skyline corridors and other methods of log removal.

The IPNF (USDA Forest Service, 2000c. [Forest Plan Monitoring and Evaluation Report for 1998. Idaho Panhandle National Forests]) recently called for updated snag guidelines: "Apply snag and down woody material guidelines from the Upper Columbia River Basin Assessment to improve marten habitat" (p. 39), unfortunately at all levels this recommendation has subsequently been ignored.

*The paltry number of snags to be retained in logging units, and the failure to specify snags of adequate **size**, contrasts with scientifically-determined habitat needs acknowledged elsewhere by the FS. The SDEIS relies on the Northern Region Snag Management Protocol, which lacks peer-review and validation from post-implementation monitoring. Harris (1999) and ICBEMP DSEIS Appendix 12 also present scientific information that contrasts greatly with the SDEIS on this topic.*

The SDEIS also fails to cite the results of monitoring that indicate the FS is capable of meeting snag requirements for wildlife species.

We suggest that the next step in snag management should involve creating a model that incorporates the new information on woodpecker foraging substrates (live trees, snags, and logs), home range sizes, number and characteristics of roost trees, multiple occupancy of snags, and needs for other habitat structures. Once this information is incorporated, the model may suggest changes to guidelines that specify numbers of snags and other habitat features by forest type and geographic area. Additional information on fall rates of snags, foraging needs of black-backed and three-toed woodpeckers, relation of the density of woodpeckers to that of secondary cavity nesters, and relation of snag density to woodpecker density would greatly improve the model.

The degree to which pileated woodpeckers prefer larger trees/snags for nesting is not recognized by the SDEIS, which also ignores many structural habitat components necessary for the pileated woodpecker. The analysis completely fails to disclose the quantitative or qualitative significance of cumulative effects due to past logging in the area.
Also, USDA Forest Service, 1990 states, "To provide suitable pileated woodpecker habitat, strips should be at least 300 feet in width…" The SDEIS also ignores many structural habitat components necessary for the pileated woodpecker. USDA Forest Service, 1990 indicates that measurements of the following variables are necessary to determine quality and suitability of pileated woodpecker habitat:

- *Canopy cover in nesting stands*
- *Canopy cover in feeding stands*
- *Number of potential nesting trees >20" dbh per acre*
- *Number of potential nesting trees >30" dbh per acre*
- *Average DBH of potential nest trees larger than 20" dbh*
- *Number of potential feeding sites per acre*
- *Average diameter of potential feeding sites*

The preferred very large diameter of nesting trees for the pileated woodpecker recognized by USDA Forest Service, 1990 (and ignored by the snag retention strategy in the SDEIS) is notable. McClelland and McClelland, 1999 found similar results in their study in northwest Montana, with the average nest tree being 73 cm. (almost 29") dbh.

*The paltry number of snags to be retained in logging units, and the failure to specify snags of adequate **size**, contrasts with scientifically-determined habitat needs acknowledged elsewhere by the FS. The SDEIS relies on the Northern Region Snag Management Protocol, which lacks peer-review and validation from post-implementation monitoring. Harris (1999) and ICBEMP DSEIS Appendix 12 also present scientific information that contrasts greatly with the SDEIS on this topic.*

The SDEIS also fails to cite the results of monitoring that indicate the FS is capable of meeting snag requirements for wildlife species.

Response: Snag protection measures are addressed in the SFEIS section 2.8. Snag habitat is discussed in the SFEIS Appendix B section A.2-h and integrated with the Chapter 4 analysis for the fisher (section 4.6-D.4), black-backed woodpecker (section 4.6-D.1), pileated woodpecker (section 4.6-D.6), flammulated owl (section 4.6-D.2), and the northern goshawk (section 4.6-D.3) in the SFEIS.

The SFEIS acknowledges the loss of some snags from logging operations. However, design features are called for to minimize this loss. Prescribed underburning would recruit new snags by fire-killing some residual green trees to help compensate for this loss (FEIS 2-52). It would be extremely difficult to predict how much snag loss is anticipated, especially when the natural density and distribution varies across the landscape. While current conditions may not meet these objectives due to existing stand structure (relatively young, healthy stands with low occurrence of quality snags), long-term management objectives are intended to manage snag habitat to exceed Forest Plan guidelines.

F.8-o Comment:
The flammulated, boreal owl and the great gray owl are species of concern that are sensitive to logging and other management activities. The IPNF provides inadequate management strategies to insure their viability. See, for example, Hayward and Verner, 1994.

Response: The flammulated owl is addressed in the SFEIS (sections 3.8-D-2 and 4.6-D.2*)*. The boreal owl and great gray owl are not sensitive species or MIS on the IPNF, so there is no requirement to provide management strategies for these species.

F.8-p Comment:
The FS has yet to design a consistent, workable, scientifically defensible strategy to ensure viable populations of the black-backed woodpeckers. The cumulative impacts of the IPNF's ongoing fire suppression policy are also not adequately considered.

Response: Black-backed woodpecker viability is addressed in the SFEIS (section 4.6-D.1). In a letter dated March 31,2005, the Regional Forester added goshawk and black-backed woodpecker to the R1 sensitive species list while data collection and evaluation were ongoing. However, the letter also stated that the Region believed that these species were not appropriate to be placed on the list due to their national rankings of G5 (globally secure, abundant and widespread) and their rankings by the states of Montana and Idaho as S3 and S4 indicating the species were not at risk.

F.8-q Comment:
The SDEIS does not indicate the degree of accuracy of the databases discussed in the SDEIS and relied on for these analyses.

Response: The database (i.e. TSMRS) is only a foundation or starting point for the analysis; it is not the only source of information. Field survey notes and the data tables, which updated the information in the TSMRS database, can be found in the project file.

F.8-r Comment:
The IPNF has admitted that the use of database habitat information, is suspect: "Habitat modeling based on the timber stand database has its limitations: the data are, on average, 15 years old; canopy closure estimates are inaccurate; and data do not exist for the abundance or distribution of snags or down woody material…" (U.S. Forest Service, 2000c). The SDEIS does not indicate the degree of accuracy of the databases discussed in the SDEIS and relied on for these analyses, as compared to the one subject to that observation.

Response: Information from the timber stand database (TSMRS) was supplemented through site visits, reconnaissance surveys and aerial photo examination. Corrected baseline habitat totals for those species for which habitat models were utilized are given in Chapter 3 section 3.8 of the SFEIS.

F.8-s Comment
Threatened and Endangered Species - Neither woodland caribou nor bald eagle are properly analyzed. When a reference to the project file is made for the rationale for no further analysis, the file needs to be provided for comment along with the EIS in order to judge whether no further analysis is indeed warranted.

Response: The methodology for the analysis of wildlife is explained in the FEIS (FEIS, pp. 3-57, 3-58).

The Council on Environmental Quality (40 CFR 1502.2) directs that impacts be discussed in proportion to their significance. Some wildlife require a detailed analysis/discussion to determine effects on a particular species. Others may not be impacted,

impacted at a level that is inconsequential, or adequately mitigated through the design of the project. Generally, these elements do not require a detailed discussion and analysis. The methodology includes use of a Species Screen which helps clarify the level of analysis and discussion required for the various species. Many elements, described on page 3-57 of the FEIS, are considered in completion of the screening process. Table 3-4 indicates that no detailed discussion and analysis is necessary for bald eagle or woodland caribou and references the project file for further rationale (FEIS, p. 3-57).

In keeping with NEPA direction to discuss potential impacts in proportion to their significance, the Mission Brush EIS contains numerous references to the project file, literature citations, and other documents such as the Forest Plan. It would be impractical to include these documents when copies of the EIS are distributed to the public. They are available for review at the Bonners Ferry Ranger District office; many of them, such as the Forest Plan and Monitoring and Evaluation Reports, are also available to the public on the IPNF's website.

The species not relevant to the project (bald eagle and woodland caribou are two of five such species) were documented in project file record WILD-02. The effects analysis and determinations are also documented in the Biological Assessment for this project, which is part of the project file.

Bald eagle were not analyzed in detail for the following reasons:

a) The Mission Brush project area is outside the normal range and use patterns of bald eagles. The nearest nesting territory is at Robinson Lake, some five miles from the project area and the nearest potential communal winter roost is at least four miles from the area.
b) All proposed actions are well removed from the shoreline areas of the Kootenai River and helicopter flight paths would not be close to known nest.
c) No cumulative effects are expected; the Mission Brush project would have no effect on bald eagles.

Woodland caribou were not analyzed in detail for the following reasons:

a) The project area provides little suitable habitat for woodland caribou and is outside areas designated for recovery. Currently woodland caribou occupation is restricted to the Selkirk Mountains – across the open and highly developed Kootenai River valley from the project area.
b) There have been no recent sightings in the vicinity of the project.
c) This project would have no effect on woodland caribou.

The biological assessment concluded there would be no effect to either woodland caribou or bald eagle (Biological Assessment, pp. 4, 5 and Appendix B section A.2).

F.9 Aquatics – Use of WATSED model

F.9-a Comment

The precision, or amount of error, in the estimates derived from the WATSED model are not disclosed. They are estimates, based upon sampling that inherently has some amount of error. WATSED estimates effects of the following items, but the EIS does not provide sufficient information on the accuracy of the estimates and model results; therefore the information is not scientifically valid or reliable.

Items of concern are:

a. The amount of activity area with detrimental soil disturbance
b. Accurate accounting for stream dynamics and routing of sediment as a result of timber sales
c. Rain-on-snow events
d. In-channel and stream-bank erosion
e. Examples of WATSED coefficients are not disclosed
f. Effects of activities on private lands when information is unavailable

Response – Use of WATSED model

The FEIS discussed the methodologies used for the aquatics analysis, including WATSED (FEIS, pp. 3-35, 3-36). The Mission Brush project used the WATSED version of methods documented in the Region 1/Region 4 Sediment Guides (USDA Forest Service 1981) and the WATBAL Technical User Guide (Patten 1989). The WATSED version was calibrated specifically for the Idaho Panhandle National Forests. It is an analysis tool that spatially and temporally organizes typical watershed response relationships as a result of forest practices. The estimated responses are combined with other sources of information and analyses to help determine the findings of probable effects.

WATSED was designed to address and integrate a vast and complex array of landtypes and disturbances within the context of a watershed and organize the evaluation according to established rule sets. The rule sets reflect watershed processes and functions based on research, data, and analyses collected locally and regionally. The calibration and validation of WATSED has been an annual process on the IPNF (Forest Plan monitoring reports; USDA Forest Service 2000, 1999, and 1998).

The model also includes simplifying assumptions, and does not include all possible controlling factors. Therefore, the use of WATSED is to provide one set of information to the technical user, who, along with a knowledge of the model and its limitations, other models, data, analysis, experience and judgment must integrate all those sources to make appropriate findings and conclusions. (emphasis added)

Further clarification of the WATSED model was included in the SDEIS (SDEIS, pp. 10-11), as follows:

> "WATSED Model Limitations
> The watershed response model, WATSED, used on the IPNF is designed to:
> - Address the *cumulative* effects of timber harvest operations, roads, and fire.
> - Accounts for drought or flood years and rain-on-snow events when those phenomenon are part of the long-term climatic record for a region.
>
> It does not attempt to analyze the effects of
> - Grazing, or
> - Mining (other than vegetation removal and road construction), or
> - Other non-forest practices.
>
> It does not attempt to simulate
> - Individual or episodic storm events, drought or flood years, or
> - The event-based response to individual events, including "rain-on-snow" events.

WATSED was designed to objectively compare relative differences between alternatives in terms of changes in trend, risks, and regimen; rather than to predict precise sediment and water yields that might occur as a result of stochastic events or non-forest related actions."

Response to Sub-Comment 1a. *WATSED estimates and accuracy of model results in regards to the amount of activity area with detrimental soil disturbance:*

As described in the Soils section of the EIS, all proposed cutting units were field-surveyed using techniques outlined in the Northern Regional Soil Quality Standards. All units except Unit 16 (34 acres in size) currently meet the soil standards (SFEIS, Appendix A, Table A-7). A field survey of this unit showed detrimental impacts at 16 percent, one percent above the Region One Soil Quality standard, due to rutting within the unit. Thus, there is one 34-acre activity area with detrimental soil disturbance within the 57 treatment units proposed for vegetation treatments (a total of approximately 4,036 acres). Under Alternative 2, Unit 16 would be rehabilitated in order to move it toward meeting the R-1 standards. (SFEIS, Appendix A, section A.4). Features designed to protect soils are listed in the SFEIS section 2.8. The SFEIS also discusses irreversible and irretrievable commitment of resources, and unavoidable adverse effects, including impact to soil productivity, as required by NEPA (section 4.8).

The detrimentally disturbed soils were included in the WATSED estimates for Alternatives 2 and 4 (Unit 16 is not included in Alternative 3). As stated above, WATSED was designed to, "objectively compare relative differences between alternatives in terms of changes in trend, risks, and regimen; rather than to predict precise sediment and water yields that might occur as a result of stochastic events or non-forest related actions." The 34 acres of detrimentally disturbed soils represent approximately 0.8 percent of the area proposed for treatment. As shown in Table 2-16 (SFEIS. Section 2.11) effects to the issue indicators selected for watershed and aquatics habitat are essentially the same under each alternative.

Response to Sub-Comment 1b. *Accurate accounting for stream dynamics and routing of sediment as a result of timber sales*:

Analysis of sediment delivery and potential effects on aquatic resources showed that the risk of any sediment generated by logging activities actually reaching a live channel is very low (under any of the action alternatives) since all ground disturbing activities would occur outside the Riparian Habitat Conservation Areas (RHCAs). (SFEIS, section 4.5-A.4-h)

Response to Sub-Comment 1c. *WATSED estimates for rain-on-snow events*:

WATSED does not evaluate increases in sediment and peak flows specifically resulting from "rain-on-snow" events or other stochastic events. It was designed to objectively compare relative differences between alternatives in terms of changes in trend, risks, and regimen; rather than to predict precise sediment and water yields that might occur as a result of stochastic events or non-forest related actions. (SFEIS, sections 3.6-B-2 and 3.6-C)

Response to Sub-Comment 1d. *WATSED estimates for in-channel and stream-bank erosion*:
WATSED does not attempt to estimate in-channel or stream-bank erosion. It is not intended nor designed to model even-based processes and functions, or specific in-channel responses. It does, however, incorporate the results of those processes in the calibration of its driving coefficients. The IPNF frequently validates the WATSED coefficients and estimates using long-term monitoring stations established across the Forest. (SFEIS, section 3.6-C)

Response to Sub-Comment 1e. *Examples of WATSED coefficients are not disclosed*:
An array of input variables are used to describe to the WATSED model the characteristics of the land for which WATSED is attempting to simulate the likely response to certain forest practices. These variables are a function of the landtypes that make up the watershed being modeled. The following table gives an *example* of those variables for a few of the Bottomland landtypes (floodplains, meadows and stream terraces) on the Idaho Panhandle National Forests.

Land Type	WATSED Landtype Group	GA group	Regional LTA	Surface Erosion Hazard	Sub-soil Erosion Hazard	Mass Erosion Potential	Land type Sediment Delivery.	LT Sensi-tivity	Soil Produc-tivity	Veg Response Unit	PNV Series	Parent Geology	Slope Range	Aspect	Elevation Range
102	49	60	10	L	L	L	59	H	MH	6/8 valley bottom	ABLA / THP	Belt alluvium & colluvium	--	All	18450 – 5400 ft
103	57	70	--	L	L	L	59	H	MH	6/8 valley bottom	ABLA / THP	Granitic alluvium & colluvium	5 to 50%	All	1850 – 5400 ft
104	56	61	--	L	L	L	43	M	MH	6/8 valley bottom	ABLA / THP	Belt alluvium	2 to 15%	All	2400 – 4400 ft
105	58	71	--	L	L	L	43	M	MH	6/8 valley bottom	ABGR / THP	Granitic alluvium	2 to 15%	All	2400 – 4400 ft

The WATSED program is also driven by coefficients that represent the local climate and hydrology for the watersheds it is trying to simulate – annual precipitation, annual runoff, monthly distribution of runoff, etc.

Response to Sub-Comment 1f. *WATSED estimates for effects of activities on private lands when information is unavailable*:
When pieces of private land are included in the cumulative effects area, the current conditions and recent activities are estimated by use of aerial photographs and other observations, including local knowledge of the area, when possible and when information is not available from the private landowners.

When the influence from lands other than National Forest System (NFS) lands appears to become dominant and the NFS influence is likely to be diluted by the management of lands beyond the NFS' ability to affect the overall watershed response, the study watershed is defined at the most-downstream point in the watershed where the NFS influence is likely to be apparent. If the private lands cannot be isolated, and they are a controlling factor in the watershed response, WATSED is not used since watershed response is a function of the entire watershed above the reach being studied.

F.9-b Comment:
WATSED analysis does not give sufficient recognition of stream dynamics and is inaccurate for sediment routing. In particular it does not recognize or accurately represent the following:

- *Elevated peak flows contribution to downstream flooding, channel erosion and sediment transport*
- *WATSED use of the Equivalent Clearcut Area (ECA) model to evaluate changes in peak flow when the ECA model consistently underestimates measured increases in flow caused by roads and logging (King, 1989)).*
- *Effects on sediment transport and channel changes during extreme events*
- *WATSED and ECA peak flow estimates do not address changes in daily and instantaneous peak flows from rain-on-snow and other storm events (MacDonald and Hoffman, 1995).*
- *Rain-on-snow and storm events occur with some regularity within the decision area. The SDEIS fails to adequately disclose that these impacts can be extremely significant, even if they are "immeasurable."*

Response:
As stated above, WATSED is one of several analysis tools used to predict effects to the watershed and aquatic habitats. It does not attempt to simulate individual or episodic storm events, drought or flood years, or the event-based response to individual events, including "rain-on-snow" events.

WATSED was designed to objectively compare relative differences between alternatives in terms of changes in trend, risks, and regimen; rather than to predict precise sediment and water yields that might occur as a result of stochastic events or non-forest related actions. On the IPNF it is designed to Address the *cumulative* effects of timber harvest operations, roads, and fire. Also, to account for drought or flood years and rain-on-snow events when those phenomenon are part of the long-term climatic record for a region. Thus, WATSED would account for rain-on-snow and storm events of a regular nature within the project area.

Since all ground disturbing activities would occur outside the Riparian Habitat Conservation Areas, the risk of sediment being transported to a live stream channel is very low (SFEIS section 4.5-A.4-h).

As stated in the FEIS, "Recent WATSED validation runs indicated that the WATSED measured responses were accurate for flow, but appeared to overestimate sediment loads," (IPNF 2000 Monitoring and Evaluation Report.)

F.10 Aquatics – Best Management Practices

F.10-a Comment
While it is perhaps widely accepted that Best Management Practices (BMPs) can reduce damage to aquatic environments from roads, BMPs fail to protect salmonid habitats from cumulative degradation by roads and logging. (Espinosa et al, 1997; Ziemer and Lisle, 1993)

Response
The Mission Brush project has four primary goals, including, "Maintain and improve the aquatic ecosystems (watershed and fisheries) in the Mission Creek and Brush Creek drainages…" (SDEIS section 1.2). The fisheries habitat conditions and results of fisheries surveys are documented in section 3.7-H of the SFEIS. In summary, westslope cutthroat trout are known to inhabit Mission Creek and have been stocked into Brush Lake over the last decade. Currently, bull trout are [not] known to inhabit Mission and Brush Creeks. Torrent sculpin inhabit large streams, and most white sturgeon are found only in the Kootenai River, but a few have been located in larger tributary streams. Burbot prefer lakes or large rivers. (SDEIS, section 3.7-I-3 and 3.7-I-5)

"By use of timing restrictions, onsite direction and Best Management Practices, sediment delivery to occupied fish habitat would be minimized (SFEIS section 4.5-A.4-h). Cumulative effects to fisheries are shown to be consistent with the Forest Plan, Endangered Species Act, National Forests Management Act, Clean Water Act, Idaho Forest Practices Act, Executive Order 12962 regarding aquatic systems and recreational fisheries, and the State of Idaho Governor's Bull Trout Plan (SDEIS, section 4.5-D).

Development of Idaho's BMPs
Idaho was among the first five states to adopt a comprehensive modern forest practices act in 1974, following passing of the Clean Water Act in 1972. The Idaho Forest Practices Water Quality Management Plan, completed in 1979, identified the rules and regulations associated with the Clean Water Act. The Idaho Department of Environmental Quality is delegated authority to implement the requirements. The USDA Forest Service and USDI Bureau of Land Management are the designated management agencies for federal lands. (Seyedbagheri, 1996)

Monitoring and Evaluation of Idaho's BMPs
In 1983 an interdisciplinary task force looked at nonpoint source pollution due to forest practices, and the adequacy of the existing BMPs and the regulatory processes for protecting water quality. Their 1985 report (Idaho Dept of Health and Welfare 1985) documented varying degrees of compliance and made recommendations for changes in the Forest Practices Act and the associated rules and regulations. Idaho Executive Order 88.32 in 1988 established a coordinated monitoring program including assessment of the effectiveness of BMPs. The monitoring program's focus for forestry BMPs is the impact of sediment on cold water biota and salmonid spawning (Clark 1990). A 1989 interdisciplinary team water quality audit report (Idaho Dept of Health and Welfare 1989) showed that, when applied, BMPs were 99% effecting in preventing obvious sediment from entering streams. Conclusion – historical sediment yields could have been reduced considerably by present-day BMPS, by amounts ranging from 4 to 95%. … Present day BMPs make it possible to reduce sediment yields. (Megahan, et. al.,1992 with internal references)

Designated BMPS for the Mission Brush Project

Appendix C explains the BMPs selected for this project. State-recognized BMPs that will be used during project design and implementation are contained in the following documents: 1) Rules and Regulations Pertaining to the Idaho Forest Practices Act, (IFPA), as adopted by the Idaho Land Board; and 2) Rules and Regulations and Minimum Standards for Stream Channel Alterations, as adopted by the Idaho Water Resources Board under authority of the Idaho Stream Channel Protection Act (ISCPA). Many of the rules and regulations for stream channel alterations are contained, in slightly different forms, in two Memorandum of Understandings (MOU) between the USFS and the State of Idaho. These MOUs are incorporated into the Forest Manual and R-1 Supplement 31, which contains provisions which are not currently state-recognized BMPs. The practices described in Appendix C are tiered to the practices in Forest Service Handbook 2509.22. They were developed as part of the NEPA process, with interdisciplinary involvement, and meet state and Forest water quality objectives. Appendix C also establishes the connection between the Forest Service Soil and Water Conservation Practices and BMPs identified in the Idaho Water Quality Standards, and identifies how the SWCP standard specifications for road construction and timber sale contract provisions meet or exceed the rules and regulations pertaining to the Idaho Forest Practices Act. (Appendix C, p. C-1)

Use of BMPs includes monitoring, to ensure they are being implemented and are effective in protecting designated beneficial uses; evaluation of the monitoring results; and information feedback for current and future activities and BMP design. The District Ranger is responsible for insuring the BMP "feedback loop" is used on all projects. (Appendix C, p. C-4)

Conditions and Expected Effects to Fisheries in the Project Area

Past fisheries surveys, Idaho Department of Fish and Game (IDFG) stocking records, and records of interviews with IDFG personnel were reviewed for timeliness and relevance to current conditions. (SFEIS, sections 3.7-E and 3.7-H)

Chapter 4 of the SFEIS, section 4.5-A.4-h, discuss the effects of sediment yield on fisheries under Alternatives 2, 3, and 4. A maximum increase in sediment delivery of 8% above existing conditions is predicted for Alternative 2, while Alternatives 3 and 4 are 7% and 6%, respectively. An increase of 8% is within the historical range of variability and would not likely be detectable when compared with the No Action Alternative (see section 4.5-A.4-c). Since all ground disturbing activities would occur outside Riparian Habitat Conservation Areas (RHCAs), the risk of any sediment generated by logging activities actually reaching a live channel is very low (Belt et al., 1992). By using timing restrictions, onsite direction, and BMPs, sediment delivery to occupied fish habitat associated with culvert removals and upgrades would be minimized. These estimates do not include the reductions in sediment delivery from decommissioning of roads (12.5 miles) and road improvements (SFEIS section 4.5-A). Under the action alternatives, road construction, culvert replacement, and decommissioning may temporarily introduce a small amount of sediment into streams. The long-term benefits of culvert replacements, removals, and road decommissioning would reduce the amount of sediment reaching streams; which, over time, increases water quality and improves habitat conditions for fish." (SFEIS section 4.8-C.c)

F.11 Aquatics – Mass Failures in the Watershed

F.11-a Comment

The SDEIS does not disclose the degree of natural and management-induced mass failures in the watershed.

Response: The FEIS included an appropriate description of mass failures in the watershed in the section titled *E Watershed Reference Conditions*. The sections clarifies, "The watershed conditions are described for each of the major areas identified for this project – Mission Creek Watershed, Hall Mountain Area, and Brush Lake Area (Figure 3-31.). Some conditions are of concern only for particular areas, and thus might not be described in detail for all three areas. For example, the potential for mass failures applies more to Hall Mountain than Mission Creek or Brush Lake." (SFEIS, section 3.6-F-1)

There is specific, detailed discussion of the reference (current) conditions in the Hall Mtn Area. "Along the southwestern end of the area, there are patches of highly dissected, unstable landtypes. Several landslides exist on these slopes especially below roads. Old slumps and failures are also present in several of the draws with intermittent channels. Some of these failures occurred during the winter of 1997 during a rain on snow event. Snowmelt runoff from roads and old skid trails saturated the hill slopes and concentrated in small intermittent draws resulting in landslides and gully formation." (SFEIS, section 3.7-G-1)

The Chapter 4 discussion of the No Action alternative, describes probable effects of not implementing an action alternative; including the risk of future mass failures. "… no road obliteration, road storage or road improvements would occur. …Risks associated with undersized culverts and ditchline problems would remain. Forest System Road (FSR) 272 would not be improved or resurfaced, which is the largest risk of sediment from roads in Mission Creek drainage. …road failures could occur under the following conditions. First, if a large stand replacing fire occurs and is then followed by a high intensity rain or

a rain-on-snow event. Or second, the occurrence of a rain-on-snow event, as discussed in the affected environment section, may also lead to road failures. Under both scenarios, if a flash flood and/or debris flow is triggered by either event, culvert failures (due to plugged culverts) or the exceedence of culvert capacity could occur. Water may then be concentrated over the top of road fills or diverted down the road or ditch and onto hillslopes unaccustomed to concentrated overland flow." (SFEIS, section 4.-5-A.4-b) Specific to the Hall Mountain area, "Risk of mass failures on Hall Mountain would fluctuate based on activities on private lands or slope destabilization due to past activities only. The obliteration of Road 272-C, which would help establish natural slope hydrology in areas of past failures, would not occur. Risk of failure associated with this road would remain the same." (SFEIS, section 4.-5-A.4-b)

The Chapter 4 discussion of Direct and Indirect Effects Common to All Action Alternatives (2, 3, and 4) explains that, "Past landslide failures were observed on the west face of Hall Mountain on steep ground both in draws and not in draw areas. The areas in draws are buffered by INFISH requirements, so the estimated probabilities of failure for areas not in draws were used to determine acceptable harvest levels." The LISA model was used to estimate the probability of failure as a result of harvest activities. The conclusion for Alternatives 2, 3, and 4 was, "There is no predicted increase of landslide risk on the west facing slopes of Hall Mountain due to harvest activities for any of the action alternatives. Additionally, 0.5 miles of road on the 2217-C spur would be decommissioned to improve slope hydrology and minimize potential for failure in area of past failures. … all landtypes with high mass failure potential on the west slope of Hall Mountain were buffered as required by INFISH…" (See Design Criteria, Chapter 2, section 2.8; and 4.5-B.2-a)

The number of failures in other areas of the project were described in Chapter 4, "Mission Creek drainage lacks the sensitive landtypes found in the Hall Mountain area and does not show evidence of landslides from extreme events." In the Brush Lake area, "No activities would occur on sensitive landtypes in any of the three action alternatives." (SFEIS, section 4.5-B.2-b)

The cumulative effects discussion of activities on private lands states, "Many of the roads used for logging activities on private lands have increased and concentrated water flows, increased the potential for landslides and delivered sediment to Mission Creek from road fill failures and road surface runoff. Sediment delivery levels from these private roads depend on the level of road maintenance activities. Un-maintained roads on the west facing slope of Hall Mountain on private land will continue to intercept and concentrate water and therefore continue to maintain and possibly increase the risk of mass failures in that area." (SFEIS, section 4.5-C.2 Other Types of Activities on Private Lands)

F.11-b Comment

Potential for Mass Failures on Hall Mountain -

The FEIS (p. 4-42) describes past landslides, slumps and failures on the west face of Hall Mountain. This suggests that the potential for mass failures on Hall Mountain is very real and has already occurred. Any additional management prescriptions carried out in the Hall Mountain area will only increase the future potential for additional mass failures as a result of intense precipitation or rain-on-snow events. The SEIS fails to disclose the limitations of mitigation measures for management prescriptions in these areas.

Response: The potential for mass failures on Hall Mountain was discussed in section 4.5-B.2-a of the SFEIS, "All landtypes with high mass failure potential on the west slope of Hall Mountain were buffered as required by INFISH (Chapter 2)." The Hall Mountain area does contain some sensitive landtypes categorized as sensitive due to high sediment delivery potential and moderate mass failure potential. Treatments on these landtypes were limited to minimal soil disturbance and are subject to timing restrictions (see Chapter 2 section 2.8 and 2.8-A.3, Features Designed to Protect Soil, Water and Fish Habitat). The choice of helicopter logging during the summer months is appropriate on this landtype because of the limited ground disturbance that is created and because soils are not saturated (project file).

The FEIS also described the Best Management Practices that would be used for the project -- Implement site-specific Soil and Water Conservation Practices as listed in Appendix C of this document (FEIS, p. 2-43). These BMPs for units, roads, and landings are designed to meet or surpass the Clean Water Standards Act and the level of Idaho State Best Management Practices for watershed protection (based on Forest Plan Monitoring, a review by Seyedbagheri (1996) and the other references cited in this document, and the site-specific knowledge and professional judgment of the district hydrologist).

Estimated Effectiveness of BMPs – Moderate to high; depending on the practice. A description of each practice and an estimate of its effectiveness are located in Appendix C of the FEIS. Research has evaluated the effectiveness of BMPs (Seyedbagheri 1996, USDA Forest Service Monitoring Reports 1995 - 2000). These practices would be implemented since they are requirements tied to the timber sale contract. The Forest Service Timber Sale Administrator would frequently review the project for compliance with these and other timber sale requirements. The North Zone aquatics staff would also do periodic monitoring to assess the effectiveness of these practices.

Effectiveness determinations and a description of the ratings are provided in Appendix C of the FEIS. The effectiveness determination provides a qualitative assessment of expected effectiveness that the implemented BMP will have on preventing or reducing impacts on water quality. The effectiveness rating is based on: 1) literature and research - must be applicable to area; 2) administrative studies - local or within similar ecosystem; and 3) professional experience - judgment of an expert by education and/or experience. The expected effectiveness of measures for this project rated either High or Moderate; none were rated as Low.

High: Practice is highly effective (greater than 90%) and one or more of the following types of documentation are available:

a) Literature/Research - must be applicable to area
b) Administrative studies - local or within similar ecosystem
c) Experience - judgment of an expert by education and/or experience.
d) Fact - obvious by reasoned thought (logical response).

Moderate: Documentation shows that the practice is effective less than 90% of the time, but at least 75% of the time.
Or
Logic indicates that this practice is highly effective, but there is little or no documentation to back it up.
Or
Implementation and effectiveness of this practice will be monitored and the practice will be modified if necessary to achieve the objective of the BMP.

Low: Effectiveness unknown or unverified, and there is little to no documentation
Or
Applied logic is uncertain in this case, or the practice is estimated to be less than 75% effective.
Or
This practice is speculative and needs both effectiveness and validation monitoring.

To assure effectiveness of the specific BMPs all activities are monitored and documented by means of the *feedback loop*. "**Monitoring**: Implementation and effectiveness of water quality mitigation measures are also monitored annually. This includes routine monitoring by timber sale administrators, road construction inspectors, and resource specialists, which is documented in diaries and project files. Basically, water quality monitoring is a review of BMP implementation and a visual evaluation of BMP effectiveness. Any necessary corrective action is taken immediately. Such action may include modification of the BMP, modification of the project, termination of the project, or modification of the state water quality standards. " FEIS, Appendix C, p. C-4.

F.11-c Comment (ICL)
To mitigate the future potential for mass failures on Hall Mountain, roads present on Hall Mountain should be decommissioned in light of the fact that many of the past landslides and failures occurred on slopes below roads.

Response: An analysis of roads and corresponding resource risks and benefits in the project area was conducted as part of the original Mission Round Prairie assessment (Project file document TRANS-03). As stated in the Mission Brush FEIS, Road 272-C will be obliterated, which would help establish natural slope hydrology in areas of past failures. Also, 0.5 miles of road on the 2217-C spur would be decommissioned to improve slope hydrology and minimize potential for failure in area of past failures. (SFEIS, section 4.5-C).

Road management for other roads in the area includes balding and brushing, repairing fill slopes, and deepening ditches (Project File document TRANS-02).

F.11-d Comment
The 34 acres of proposed treatment on portions of Units 27 and 32 that are classified as sensitive because of sediment delivery potential and categorized as moderate for mass failure potential in the FEIS (p. 4-41) should be excluded from the project. Although these two units are highly unlikely to affect Mission Creek, the potential for sediment delivery and mass failure is concerning and could affect the Kootenai River.

Response: These treatment units were designed with careful consideration of the potential impacts to the soils and potential for sediment delivery and mass failure. The LISA model was used to estimate the probability of failure for harvest activities with varying percentages of vegetation removal on different slopes. Probabilities of failure were also estimated during "event conditions", such as the rain-on-snow event that occurred during 1997. Potential for sediment delivery by landslides is greatly

reduced by restricting harvest intensities in areas with a potential for landslides. In accord with the site-specific LISA analysis, harvest prescriptions on slopes greater than 60% were limited to 20% stem removal; and on slopes between 55 and 60%, harvest was limited to no more than 50% stem removal. This limitation was applied to all alternatives and led to the following conclusion: Alternatives 2, 3, and 4: for any of the action alternatives, there is no predicted increase of landslide risk on the west facing slopes of Hall Mountain due to harvest activities. (SFEIS, section 4.5-B.2-a).

Unit 32 is a mixture of group selection and commercial thinning; Unit 27 will be treated with an improvement cut (SFEIS, section 2.7-B). "Since these units are going to be helicopter logged [during the summer] and there would be no logging within the RHCAs, sediment delivery from these units is considered negligible. Cacek 1989 determined that clearcut logging on sensitive landtypes within the Lightning Creek watershed only accounted for 1.4 percent of the mass failures," (SFEIS, section 4.5-B.2-a). Cacek concluded that the dominance of road-related slide activity (75.5% was produced by sites impacted by roads or roads and clearcuts; only 1.4% was contributed by slides related only to clearcuts) concurs with previous work in other areas within the Pacific Northwest. *The Relationship of Mass Wasting to Timber Harvest Activities in the Lightning Creek Basin, Idaho and Montana; Cacek, 1989, pp. iii-iv.*

F.12 Fish

F.12-a Comment:
The SDEIS fails to demonstrate compliance with the Forest Plan fry emergence standards and other related Forest Plan requirements. The IPNF's decision to implement the fry emergence Forest Plan amendment is still under review therefore the Forest Plan as before the amendment is still in effect. Therefore, the SDEIS is not in compliance with NEPA and NFMA.

Response: Forest Plan Amendment for Fry Emergence. Since the release of the Mission Brush Draft Supplemental EIS, the Idaho Panhandle National Forests has amended the Forest Plan regarding requirements pertaining to fry emergence success (IPNF 2005. Fry Emergence Amendment Decision Notice and Finding of No Significant Impact. 70 pages).

On June 2, 2005, the Forest Supervisor for the Idaho Panhandle National Forests signed a Decision Notice and Finding of No Significant Impact that amended the Forest Plan to modify or remove objectives, standards, and monitoring requirements pertaining to fry emergence success (IPNF 2005). The amendment was implemented because the fry emergence objectives, standards and monitoring requirements that were in the IPNF Forest Plan did not contribute as well as INFS objectives, standards, guidelines, and monitoring direction towards meeting the goals of providing sufficient habitat in support of maintaining diverse and viable populations of fish species across the forest. In addition, because of the limited application of the fry emergence models and their unreliability, and the inability to determine fry emergence success in the field due to high variability affected by multiple natural and human-caused factors, the Forest Service was not able to state with any degree of certainty whether measures of fry emergence success were accurate or precise.

F.12-b Comment:
The FS misplaces the threats to clean water onto vegetative conditions instead of correctly identifying the true threats to watershed health. The Western Montana Level I Bull Trout Team (2001) state:

> *(T)he real risk to fisheries is not the direct effects of fire itself, but rather the existing condition of our watersheds, fish communities, and stream networks, and the impacts we impart as a result of fighting fires. Therefore, attempting to reduce fire risk as a way to reduce risks to native fish populations is really subverting the issue. If we are sincere about wanting to reduce risks to fisheries associated with future fires, we ought to be removing barriers, reducing road densities, reducing exotic fish populations, and re-assessing how we fight fires. At the same time, we should recognize the vital role that fires play in stream systems, and attempt to get to a point where we can let fire play a more natural role in these ecosystems.*
>
> *The biologists emphasize, "the importance of wildfire, including large-scale, intense wildfire, in creating and maintaining stream systems and stream habitat." The biologists continue "in most cases, proposed projects that involve large-scale thinning, construction of large fuel breaks, or salvage logging as tools to reduce fuel loading with the intent of reducing negative effects to watersheds and the aquatic system are largely unsubstantiated." The biologists point out that logging, thinning and fire suppression can have harmful effects on watersheds (Id.). We ask that the FS explicitly consider the Western Montana Level I Bull Trout Team position paper in the subsequent NEPA document.*

Response: As stated in the FEIS section 4.5-C.1-c, there are no bull trout in the cumulative effects area. Decommissioning roads, replacing culverts and improving drainage will reduce the amount sediment delivery and the risk of sediment delivery to the watersheds. From section 4.5-D.8 in the SFEIS, The action alternatives are consistent with the State of Idaho Governor's Bull Trout Plan and the long-term effects are expected to benefit bull trout and their habitat.

F.12-c Comment
Fry Emergence and Timing of Management Prescriptions:

Te EIS discusses how the project will minimize sedimentation and the potential effects on fry emergence in these watershed for the duration of the Mission Brush project. The following statements (SDEIS, page 56) describe the preferred alternative and alternatives 3 and 4: "By using timing restrictions, onsite direction, and BMPs, sediment delivery to occupied fish habitat associated with culvert removals and upgrades would be minimized." With regard to goshawk nesting, ecosystem burning, and harvesting in historic bear use areas, the EIS has specified the timing of certain management prescriptions in more detail. Information regarding timing of other prescriptions is lacking; particularly those related to decreased fry emergence as a result of the poor timing of treatment(s).

Response:
The FEIS discussed the potential for sediment and its effects on the fisheries in the project area and identified this concern as part of the principle aquatic issues (FEIS, p. 2-5). Measures to protect fisheries are described in Common Features, Required Design Criteria, and Estimated Effectiveness for All Action Alternatives (Chapter 2, section 2.6). The FEIS clearly states that no cutting will occur, at any time, in the Riparian Habitat Conservation Areas (RHCAs) as specified in BMP 14.03 listed in Appendix C of the FEIS. These practices comply with the standards and guidelines in the Inland Native Fish Strategy (INFS). All action alternatives include stream protection zones that meet or surpass INFS requirements. Stream protection zones (Streamside Management Zones) have been shown to be effective in moderating cumulative watershed effects (Belt et. al., 1992). See FEIS, p. 2-46.

Additional mitigation measures, and their effectiveness ratings, are described on pages 2-50 through 2-51 in the Final EIS. They include the following measures and statements of effectiveness:

Best Management Practices.
Estimated Effectiveness - Moderate to high; depending on the practice. Research has evaluated the effectiveness of BMPs (Seyedbagheri 1996, USDA Forest Service Monitoring Reports 1995 - 2000).

Sediment Reduction - Spot gravelling with approximately 6 inches of gravel would be required at all stream crossings, rolling dips, and in any wet areas.
Effectiveness Rating: High; this measure is 92% effective in reducing the amount of sediment delivered to streams (Foltz and Truebe 1995).

Inland Native Fish Strategy – Commercial timber cutting would be prohibited in RHCAs using the guidelines established by the Inland Native Fish Strategy (INFS). These no-harvest zones include 300-foot (slope distance) protection zones for perennial fish-bearing streams, a 150-foot protection zone for perennial non-fish bearing streams, a 100-foot protection zone for ponds, lakes, reservoirs, and wetlands greater than one acre, and a 50-foot protection zone for intermittent streams and sensitive landtypes since Mission Creek and Brush Creek are not priority watersheds. Ephemeral draws would have a 50-foot (slope distance) protection zone if they are either directly tied to an intermittent channel, or lack large woody debris and vegetation that prevent scouring or head cutting. Some hazard tree removal may occur within the Brush Lake Campground area for public safety. The campground currently exists within the RHCA. This is consistent with INFS direction (USDA 1995; Appendix A, RA-2).
Estimated Effectiveness: Generally high; a description of each applicable INFS standard and guideline and its estimated effectiveness may be found in FEIS Appendix B.

Road Surface and Drainage Crossing Maintenance to Improve Aquatic Habitat - The main source of erosion and sediment delivery from roads is usually from the road surface. Road maintenance activities that focus on reducing sediment delivery are blading along the road prism; spot surfacing at stream crossings; installing relief culverts where ditch lengths are too long; cleaning and improving ditches; cleaning the inlet and outlets of culverts; and installing rolling dips and outlet ditches. These activities would help improve road surface drainage and decrease sediment delivery to stream channels. Road drainage crossings that pose a hazard and risk to aquatic species and their habitat from sediment delivery have been evaluated throughout the project area. Recommendations for each crossing may include replacing, redesigning or upgrading crossings as needed. Specific road improvements to reduce sediment risks are listed on page 2-51 of the FEIS.
Estimated Effectiveness: High; proposed road surfacing and drainage crossing upgrades would occur because they would be included in the road package as part of the Timber Sale Contract or would be accomplished by the Forest Service using appropriated or other funding.

Forest Plan Amendment for Fry Emergence - Since release of the Mission Brush Draft Supplemental EIS, the Idaho Panhandle National Forests has amended the Forest Plan regarding requirements pertaining to fry emergence success (IPNF 2005. Fry Emergence Amendment Decision Notice and Finding of No Significant Impact. 70 pages).

On June 2, 2005, the Forest Supervisor for the Idaho Panhandle National Forests signed a Decision Notice and Finding of No Significant Impact that amended the Forest Plan to modify or remove objectives, standards, and monitoring requirements pertaining to fry emergence success (IPNF 2005). The amendment was implemented because the fry emergence objectives, standards and monitoring requirements that were in the IPNF Forest Plan did not contribute as well as INFS objectives, standards, guidelines, and monitoring direction towards meeting the goals of providing sufficient habitat in support of maintaining diverse and viable populations of fish species across the forest. In addition, because of the limited application of the fry emergence models and their unreliability, and the inability to determine fry emergence success in the field due to high variability affected by multiple natural and human-caused factors, the Forest Service was not able to state with any degree of certainty whether measures of fry emergence success were accurate or precise.

F.12-d Comment (ICL)
Presence of Bull Trout - Page 12 of the SDEIS states that, "Currently, bull trout are known to inhabit Mission and Brush Creeks." However, page 3-41 of the FEIS states that, "Currently, bull trout are not known to inhabit Mission or Brush Creeks." Clarify the discrepancy between the SEIS and the FEIS since it has serious implications for the Mission Brush project.

Response: The FEIS described the correct condition for bull trout occurrence in the project area – they are not known to inhabit Mission or Brush Creeks. We apologize for the typographical error in the Supplemental DEIS. The information has been corrected in the Supplemental Final EIS.

F.13 Cataloging and Cumulative Effects

F.13-a Comment
The SDEIS fails to provide the data on results of surveys of tree species regeneration, and statistics on species of trees planted in old logged units.

F.13-b Comment
The discussion about past timber sales is too cursory for understanding cumulative effects; in particular it does not include the following:

- *Ground surveys when past activities are not reflected in current TSMRS or similar databases*
- *Locations and acreages of past and ongoing activities*
- *Goals of past projects, assumptions used in the goals, and whether or not those goals were met*
- *Significant monitoring information related to potentially similar impacts*
- *Whether or not results of past projects led to the Mission Brush Purpose and Need*

F.13-c Comment
The SDEIS does not disclose the effects caused by the human use of the forest adjacent to roads, including firewood cutting, on resources such as the following:

- *old growth,*
- *amounts of current and recruitment large woody debris for soil renewal and wildlife habitat,*
- *wildlife species needing standing snags.*

Response to Comments F.13-a, F.13-b,. F-13-c:

The Supplemental Draft EIS was prepared to address analysis issues raised through the opinion issued through the U.S. Court of Appeals for the Ninth Circuit in *Lands Council v. Powell*, 395 F.3d 1015-1046 (9th Cir. 2005). The SDEIS incorporated Chapters 3 and 4 of the Final EIS (2004) and focused on the portions of the affected environment that are related to the 9th Circuit's opinion, including past harvest activities on private land and how they affected the existing condition of the natural resources. The Final EIS (2004) included past harvest activities on National Forest System lands, as well as ongoing and reasonably foreseeable activities on both ownerships. Thus, cumulative effects of activities on both private and National Forest System lands within the project area have been accounted for.

As explained in Chapter 3 of the SFEIS (section 3.3-A3) recent guidance from the Council on Environmental Quality clarifies the extent to which agencies of the Federal government are required to analyze the environmental effects of past actions when describing the cumulative effects of a proposed action (CEQ, June 2005). CEQ states that, "Agencies are not required to list or analyze the effects of individual past actions unless such information is necessary to describe the cumulative effects of all past actions combined. Agencies retain substantial discretion as to the extent of such inquiry and the appropriate level of explanation[2] . … Generally, agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions. … The extent and form of the information needed to analyze appropriately the cumulative effects of a proposed action and alternatives under NEPA varies widely and must be determined by the federal agency proposing the action on a case-by-case basis. …The analysis of environmental effects must focus on the aggregate effects of past, present and reasonably foreseeable future actions that are truly meaningful… of significance to the proposal." (CEQ, June 2005, pp. 2,3)

CEQ also provides guidance for instances when the TSMRS database, similar databases or other sources of information do not include some pieces of information regarding reasonably foreseeable effects. "The focus of this provision[3] is, first and foremost, on "significant adverse impacts." The agency must find that the incomplete information is relevant to a "reasonably foreseeable" and "significant" impact[4] before the agency is required to comply with 40 CFR 1502.22."

The SDEIS and Supplemental Final EIS included the following information that pertains to the above comments (arranged by comment):

1. Data on tree regeneration and species planted in past logging units

Timber management is known to have occurred in the project area as far back as 1909 . The effects of that management varied depending on the type of harvest and logging systems that were used. Regeneration would also have varied depending on whether it was natural regeneration or planting (SFEIS, section 3.4-B). While regeneration and planting do have an effect on the vegetation, fire has been documented as *the* major disturbance factor that produces vegetation changes in the local forest ecosystems (SFEIS section 3.4-A-1). Lesser factors are fire suppression, past logging practices, and white pine blister rust fungus (SFEIS, section 3.3-B)

The National Forest Management Act specifies that lands where timber harvest occurs should be adequately restocked with trees within five years after final harvest. The Forest Plan specifies that 90 percent of harvested lands shall be adequately stocked within five years following final regeneration harvest.

The Forest Plan Standards for timber management include the following:

> #4 - Reforestation will normally feature seral species, with a mixture of species usually present. Silvicultural practices will promote stand structure and species mix, which reduce susceptibility to insect and disease damage.
> #5 – Project design will provide site preparation and slash hazard reduction practices that meet the reforestation needs of the area.
> #9 – The silvicultural prescription for each stand will establish the level of management intensity compatible with the management area goals. Preferred species management as identified in the silvicultural prescription will consider both biological and economic criteria. (Forest Plan, pp. II-31, II-32)

Overall, the Bonners Ferry Ranger District regeneration surveys show that the planting program has a 90 to 95 percent success rate (personal communication T. Sternberg, 2005). In harvested areas that do not meet 90 percent success, additional measures are taken to reach the Forest Plan standard.

Forest Plan Monitoring Reports display the success rates Forest-wide for regeneration of past logging units. The following table is from page 10 of the 2003 report.

Forest Average For Stands Satisfactorily Stocked Within Five Years

Year	Average Stocked Within 5 Years
1983	86%

[2] *Marsh v. Oregon Natural Resources Council, 490 U.S. 360, 376077 (1989) as referenced in CEQ, June 2005.*
[3] NEPA 40 CFR 1502.22 Incomplete and Unavailable Information. (Reference added.)
[4] NEPA 40 CFR 1502.27 Significantly requires consideration of both context and intensity. (Reference added.)

Year	Average Stocked Within 5 Years
1984	90%
1985	94%
1986	95%
1987	96%
1988	96%
1989	92%
1990	86%
1991	78%
1992	78%
1993	81%
1994	98%
1995	99%
1996	96%
1997	84%
1998	58%

The years listed in the table indicate the year that the final regeneration harvest occurred and the 5-year timeframe for reforestation began. When the success rate is less than 90%, additional treatments are used to bring the stand to the Forest Plan standard. The 1998 average of 58 percent adequately restocked is a lower percentage than normal and was due to recent drought problems and time delays for site preparation activities that occurred on one district. Most of these units will be planted in fiscal year 2004.

2. Past Activities Determined to Need Detailed Disclosure or Analysis

In keeping with NEPA requirements for analysis of cumulative effects, the planting in the Brush Lake area following the 1945 Brush Lake wildfire was determined to need detailed disclosure and analysis. It is different from other planting on National Forest Systems lands because the seedlings were not grown from a local seed source. Thus, the seedlings were not adapted to the local climate, soil and ecological conditions in the area; most of these "off-site" trees are dying from root diseases and bark beetles (see SFEIS, section 3.4-F).

The remainder of the past regeneration in the project area (both private and National Forest System lands) did not warrant detailed individual discussions. However, past activities are listed to assist the public and the decision-maker in knowing the activities that were included in the analysis for both the existing condition write-up and cumulative effects conclusions. The FEIS list of past National Forest timber sales shows 16 specific sales that used even-aged management, plus additional acres of even-aged treatments where some information is incomplete (SFEIS, section 3.3-B-2). The effects of regeneration (natural or planted) in these past harvest units is accounted for in the existing condition discussion in Chapter 3.

Effects of past harvest activities on both National Forest System lands and private lands and how they have influenced the existing environment, and contribute to any cumulative effects, are disclosed in the Supplemental Final EIS as follows:

- Effects to Vegetation - sections 3.3-A, 3.3-B, 3.4 and 4.2-A.1, 4.3-A, 4.3-B, 4.3-C, 4.3-D, 4.3-E, 4.3-F; and 4.4
- Effects to Aquatics - sections 3.6, 3.7 and 4.5-C.2. Includes specific mention of the Rock Pine and Harebrush timber sales scheduled to terminate in 2004, and 2006, respectively; but concludes that no effects to the watershed are expected to occur from these activities.
- Effects to Wildlife – sections 3.8 and 4.6B.
- Effects to Recreation – sections 3.9, and 4.7.

The SFEIS lists past harvest activities on private lands and discusses the types of effects that resulted from these sales (SFEIS, Appendix A, section A.3-a and Tables A-1 and A-2). The discussion explains how past activities were analyzed for the following resources: vegetation, soils, aquatics, old growth, wildlife, and recreation. Tables A-1 and A-2 (SFEIS, Appendix A) display the type of harvest (regeneration or thinning) and summarizes the types of effects that were likely to result.

F.14 EPA comments on SDEIS

F.14-a Comment

In a letter dated June 18, 2004, EPA stated that the final EIS and ROD adequately addressed its comments made on the draft EIS. However, EPA remained concerned about the continued high sediment yields to streams within the project area. We recommend that the Final EIS consider reducing the amount of management activities that would take place in units 16 and 122. At the least, it would be helpful to include a rationale describing why management activities could not be avoided in these harvest units. We also recommend that the Final SEIS discuss the timing of activities that would be implemented to reduce the risk of soil loss from Unit 16.

Response

The purpose and need for entering the Mission Brush project area includes four primary considerations – vegetation, aquatics, wildlife habitat, and recreation. The vegetation goal is summarized as, "Trend the vegetation composition, structure, and diversity of landscape patterns toward desired future conditions across the landscape by providing for tree species and stocking levels similar to historic levels that resist insects, diseases, and stand-replacing wildfire(s). Improve landscape patterns by creating openings that more closely resemble those that occurred historically created by fire before active fire suppression." (FEIS, section 1.2-A)

Management recommendations that relate to the Mission Brush project area are specifically focused on the restoration of long-lived early seral species (ponderosa pine, larch, and western white pine). These recommendations include: a) Using regeneration harvest and prescribed fire to create openings that will favor development of long-lived early succession tree species, including blister rust-resistant western white pine, and b) using a variety of silvicultural methods (thinning and regeneration) and prescribed fire to sustain and favor long-lived early succession tree species where they are present. (SFEIS, section 1.2-A5-D)

Restoring long-lived early seral species would:

- Reduce the extent of drought- and fire-intolerant species (grand fir, hemlock, and cedar) on sites where they are not well adapted and are likely drought-stressed.
- Reduce the extent of short-lived early seral forest species (Douglas-fir and lodgepole pine) that are near the end of their pathological rotation age.
- Lower the risk of large, severe disturbances such as stand-replacement fires.

Potential sediment yield and delivery to streams was identified as one of the principal aquatic issues. The percent change in the magnitude, intensity, and duration of sediment delivery in Mission Cr and Brush Cr watersheds was selected as one of the indicators for the aquatic resources. (SFEIS, section 2.3-A)

Alternative 2 is an integrated multi-disciplinary approach to ecosystem management. It is designed, in part, to begin the restoration of forest ecosystem processes, vegetation composition and structure, to improve dry site old growth habitat and return the role of fire in the ecosystem. It includes silvicultural treatments on approximately 4036 acres. (SFEIS, section 2.7-B)

The treatment for Unit 16 meets the purpose and need for this project and the management recommendations for the project area, as described above. Unit 16 was included in Alternatives 2, and 4; but dropped in Alternative 3. In Alternative 2, Unit 16 will treat approximately 34 acres using an irregular shelterwood cut. As analyzed in Alternative 4, Unit 16 will treat approximately 34 acres using a seed tree cut. In combination with prescribed underburning, either of these harvest prescriptions would have multiple roles. Prescribed fire will be used as tool to burn slash, recycle nutrients, resprout decadent brush (browse for wildlife), reduce heavy duff layers around relic trees, harden the bases of ponderosa pine (creating long-standing, rot-resistant snags for wildlife), and prepare the units for natural or artificial regeneration (planting) into seral species. (SFEIS, section 2.7-B and Table 2-8). More specifically, the objective for treating Unit 16 is to favor the development of larch and white pine. Generally, the larger-diameter trees with full live crowns would be retained for seed, shelter and future snags for the new stand.

Analysis of sediment delivery and potential effects on aquatic resources showed that the risk of any sediment generated by logging activities actually reaching a live channel is very low (under any of the action alternatives) since all ground disturbing activities would occur outside the Riparian Habitat Conservation Areas (RHCAs). (SFEIS, section 4.5-A.4-h)

The main concern related to Unit 16 was potential soil compaction. A field survey of this unit showed 16% detrimental impacts to the soils within the treatment unit; this is one percent above the Region One Soil Quality standard and was due to

rutting within the unit. The proposed treatments will not result in any additional detrimental compaction (SFEIS, section 4.2-A.2-b).

The soils analysis is based on direction from Forest Service Manual 2500, R-1 Supplement 2500-99-1. Section 2554.03 describes regional policy and states "… In areas where more than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration should not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality.

Cumulative impacts compiled from the proposed skidding / yarding systems were estimated using monitoring data from the IPNF (Niehoff), the extent of the current trail system (if any) as a baseline and adding any detrimental impacts from additional skid trail extensions as applicable. Any new skid trails would be designed to meet the Region 1 soil quality guidelines and would be subject to mitigation measures such as winter harvesting over snow and slash as described in the mitigation section of Chapter 2 in the Final EIS. (SFEIS, section 2.8-A.1-j)

Where skid trails exist from previous operations, the amount of additional detrimental soil compaction is dependant on the following factors:

a) Existing landings and skid trail patterns will be used to provide access to most of the area within the units. Extensions or branches from existing skid trails in the units is usually projected to be 0 to 8% per unit area; depending on the amount of new trail extensions, type of equipment, rock content in the soil, and the timing of operations.
b) Detrimental soil compaction is mitigated by running equipment over frozen or rocky soils, a snow layer greater than 18" in depth, or a slash mat in the skid trails (monitoring report - Niehoff). These practices will be used in the implementation of the Mission Brush EIS.
c) In accordance with Region 1 soil guidelines, those units (i.e. #16), with existing detrimental soil compaction over 15%, will have the surplus skid trails decompacted, trending the unit back to a net improvement regarding the amount of detrimental soil compaction, displacement or rutting.

The effectiveness of the design criteria and mitigation measures to protect the soil resources are describe for this project in th4e Soil Resources report (Appendix A section A.4 *Features Designed to Protect Soil and Site Productivity*)

APPENDIX E

Table E-1. Old Growth Stands within OGMU 19 and 20

Stand ID	Acres	Old Growth Code	Forest Habitat Type
71901002	46	11	DRY
71901007	35	11	DRY
71901030	55	9	DRY
71901082	18	9	DRY
71901091	32	11	DRY
71901093	194	11	DRY
71901097	17	9	DRY
72001002	44	9	COOL-MOIST
72001012	30	9	MOIST
72001016	30	9	COOL-MOIST
72001017	27	9	MOIST
72001018	34	9	MOIST
72001019	39	9	MOIST
72001020	22	9	COOL-MOIST
72001022	19	9	MOIST
72001023	15	9	COOL-MOIST
72001043	22	9	COLD-DRY
72001044	12	9	MOIST
72001045	19	9	MOIST
72001046	12	11	COOL-MOIST
72001047	22	9	MOIST
72001048	20	9	MOIST
72001052	8	11	COOL-MOIST
72001058	14	9	MOIST
72001059	148	9	MOIST
72001060	19	9	MOIST
72001061	41	9	MOIST
72001062	47	9	MOIST
72001073	9	9	MOIST
72001074	13	9	MOIST
72001075	18	9	MOIST
72001076	11	9	MOIST
72001079	8	9	COOL-MOIST
72001083	23	11	MOIST
72001087	8	9	MOIST
72002074	96	9	MOIST
72003019	10	9	MOIST
72003020	11	9	MOIST
72003021	30	11	MOIST
72003022	10	9	MOIST
72003033	7	11	MOIST
72003034	11	9	MOIST
72003035	12	9	COOL-MOIST
72003050	22	9	COLD-DRY

Stand ID	Acres	Old Growth Code	Forest Habitat Type
72003054	54	9	MOIST
72003062	24	9	COOL-MOIST
72003063	33	9	MOIST
72003069	21	11	MOIST
72004012	19	9	MOIST
72004014	17	9	MOIST
72005001	26	9	MOIST
72005005	53	9	MOIST
72005010	16	9	COOL-MOIST
72005012	8	9	MOIST
72005018	16	9	MOIST
72005020	41	9	MOIST
72005022	13	9	MOIST
72005024	25	9	MOIST
72005027	24	9	COLD-DRY
72005044	24	9	MOIST
72007067	166	11	DRY
72007068	47	11	DRY
TOTALS	**1965**		

Allocated Existing Old Growth *(codes 9);* Allocated Potential Old Growth *(code 11)*

Table E-2. Non Allocated Recruitment[1] Stands within OGMU 19 and 20

Stand ID	Acres	Forest Habitat Type
71901025	19	COLD-DRY
71901036	45	DRY
71901061	77	DRY
71901086	17	DRY
72001008	12	COLD-DRY
72001015	13	COOL-MOIST
72001021	39	COOL-MOIST
72005038	27	MOIST
72009055	24	MOIST
	274	

Non-Allocated Recruitment (*code 8*)

[1]These stands are NOT part of the District's 64,625 acres (16%) of allocated old growth nor the IPNF's 276, 494 acres (12%) of allocated old growth. These recruitment stands do NOT meet the IPNF's old growth standards as described in Green, and others (2005). Additionally, there are no Forest Plan standards that address recruitment stands. Information regarding recruitment stands is provided in response to comments from the DEIS.

Table E-3. Old Growth and Recruitment Stands with Proposed Treatments[2] –All Action Alternatives

Stand ID	OGMU	Treatment Unit(s)	Old Growth Code	Treatment Acres in Old Growth
71901002	19	22	11	30
71901030	19	26	9	17
71901061	19	27	8	68
71901091	19	30	11	32
71901093	19	28, 30	11	194
71901097	19	30	9	6
TOTALS				**345**

[2]Proposed treatments in all alternatives are **Improvement Cut** prescriptions in dry forest types. A total of 277 acres of treatments are proposed in allocated old growth stands and 68 acres are proposed in recruitment stands.

Figure E-1. Mission Brush Old Growth Stands and Proposed Treatments–All Action Alternatives

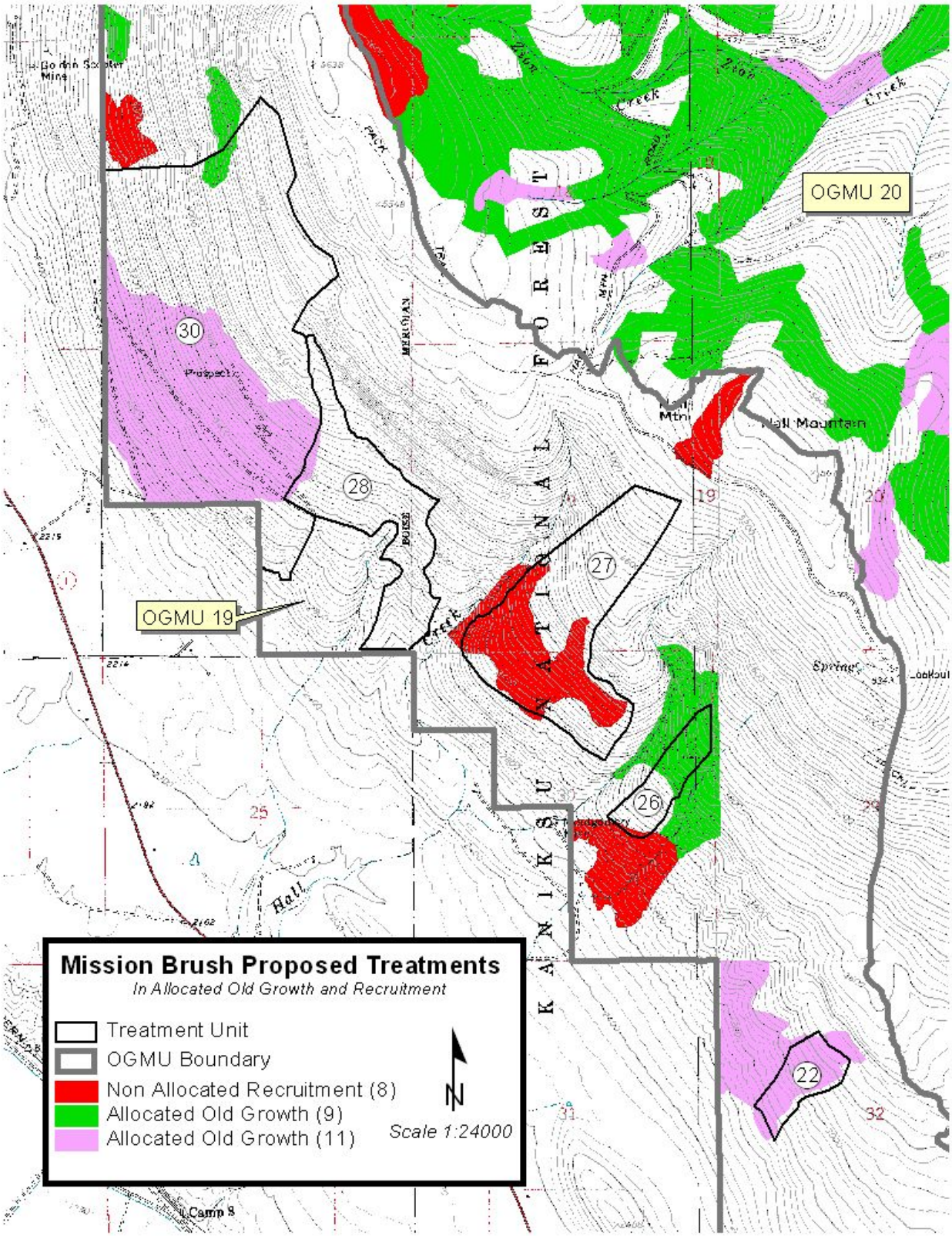
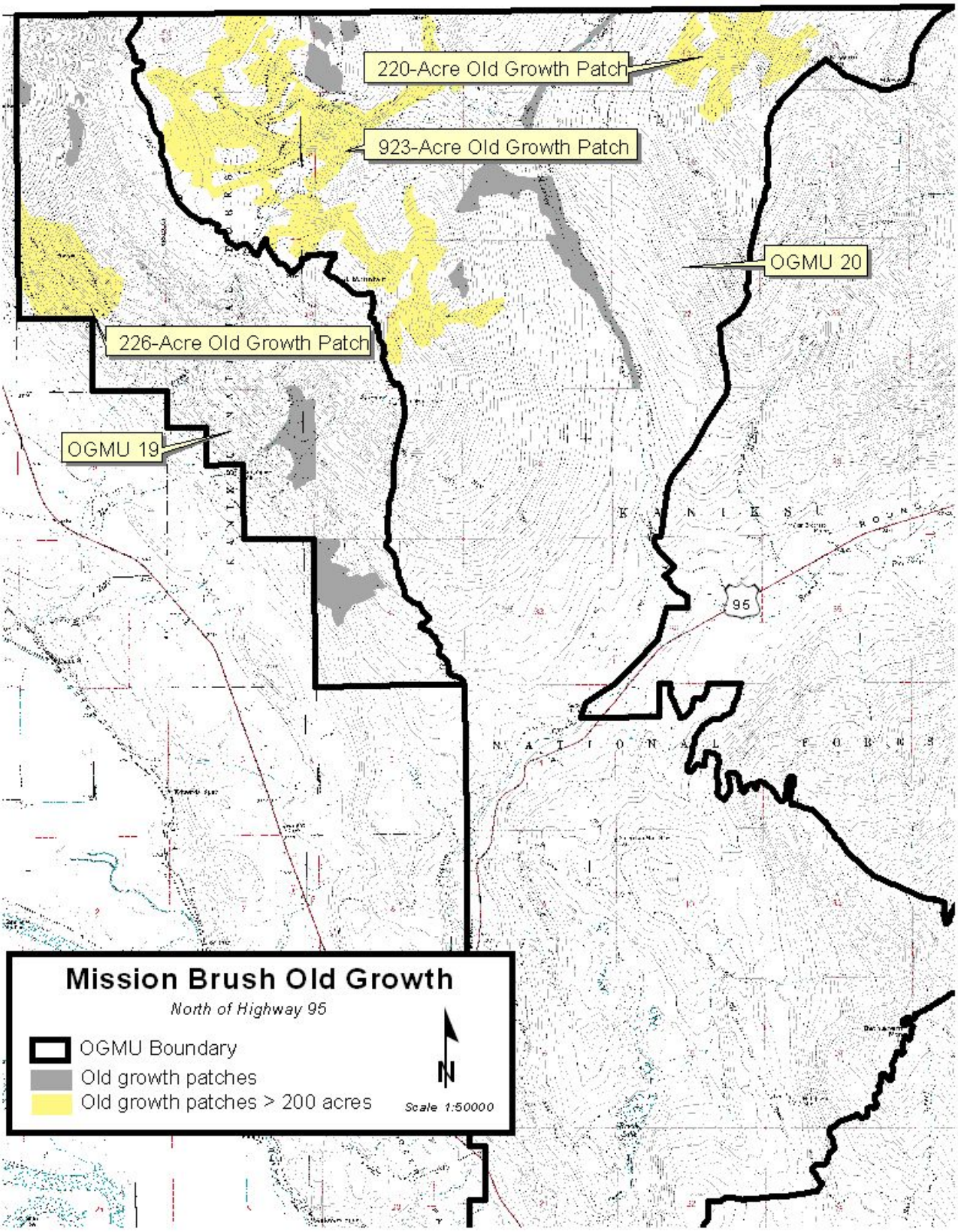
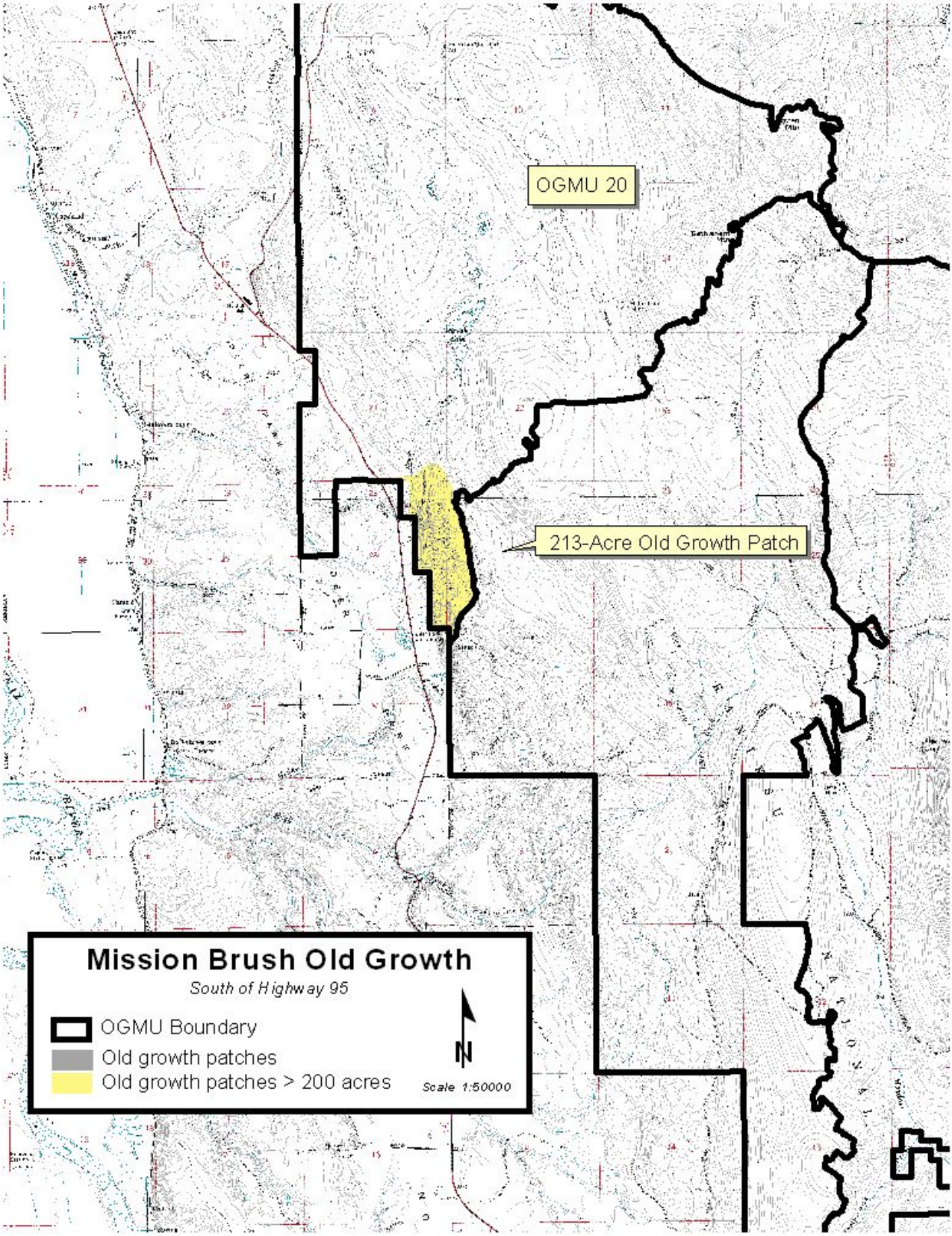


Figure E-2 – Mission Brush Old Growth Patches




OGMU 20
213-Acre Old Growth Patch
Mission Brush Old Growth
South of Highway 95
OGMU Boundary
Old growth patches
Old growth patches > 200 acres
N
Scale 1:50000